PESTICIDES ABSTRACTS

March 1981 - Vol. 14, No. 3

Abtracts 80-0601-0900

PSTAB 14(03) 131-259 (1981)

Quarterly Index Issue

U.S. ENVIRONMENTAL PROTECTION AGENCY

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES AND TOXIC SUBSTANCES
Management Support Division
RM E-447 401 M Street, S.W.
Washington, D.C. 20460

PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Management Support Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

CONTENTS

Volume 14 March 1981 No.3

General 131
(Phytotoxicity studies; information on production and use; and other items of general interest. Includes news items, letters and editorials appearing in scientific and technical journals)

Monitoring and Residues 139
(levels of pesticides in people or nonexperimental animals or in water, air, soil, food, feed, and other consumer products)

Epidemiology, Prevention and Treatment 151
(Frequency and distribution of pesticide poisoning in man or nonexperimental animals and treatment of clinical cases; morbidity and mortality; safety measures; decontamination; disposal of containers and wastes; legislation and regulations)

Toxicology and Pharmacology .....
(Toxicity studies in man and animals; effects on cells; organs, and systems; metabolic studies, biochemistry, interactions; antidotes and other treatment; mode of action. Ordinarily, articles dealing with efficacy studies are not included.)

Analysis 189
(preparation of samples; analytical methods; instrumentation)

Quarterly Index, January - March
Preface 199
Subject Index
I. Concepts 200
II. Compounds 219
Author Index
Personal 250
Corporate 259

81-0601. Lee, S. D., ed.; Mudd, J. B., ed. (Environ. Criteria Assess. Off., US EPA, Cincinnati, OH) **Assessing Toxic Effects of Environmental Pollutants.** *ACS Symp. Ser.* 174: 306 pp.; 1979.

This book considers the toxicity assessment of environmental pollutants. Biophysical and biochemical methods which may provide sensitive toxicity assessment methods and aid in the study of mechanisms of toxicity are presented. Human health effects and the difficulties of human toxicity assessment based on laboratory animal tests are considered. Inhalation is presented as a common route of pollutant exposure. The effect of pollutants on the lung are emphasized. The use of lung organ cultures for toxicity assessment is considered. Sources of pollutants examined include automobile exhaust, industrial, cigarette smoke, and herbicides and pesticides. Effects examined range from cell membrane changes to mutagenicity and carcinogenicity. This book is a result of a symposium at the 174th American Chemical Society meeting. Abstracts of chapters from this book will appear in appropriate sections of this issue of *Pesticides Abstracts.*

81-0602. Shadoff, L. A. (Anal. Lab., Dow Chemical, Midland, MI 48640) **The determination of 2,3,7,8-tetrachlorodibenzo*p*-dioxin in human milk.** *ACS Symp. Ser.* 136(CH15): 277-285; 1980 (22 references).

The possibility that humans are exposed to TCDD has been considered by several laboratories. In order to be certain of the findings, detection levels must be on the order of 1 ppt. A very selective sample preparation system is presented which is capable of preserving pg quantities of 2,3,7,8-TCDD. The method involves extraction, partition, and flow-through liquid chromatography. Analysis is by mass spectrometry. Results from studies of samples of human milk for possible contamination with 2,3,7,8-TCDD are reviewed. Samples came from all geographical areas in the United States in which there was suspected TCDD contamination. In no case was there a confirmed detection of TCDD.

81-0603. Witschi, H. R., ed. (Biol. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830) **The Scientific Basis of Toxicity Assessment.** *Dev. Toxicol. Environ. Sci.* 6: 329 pp.; 1980.

This book consists of papers presented at the 1979 Symposium on the Scientific Basis of Toxicity Assessment sponsored by the Biology Division of Oak Ridge National Laboratory. Problems and issues in the science of toxicology are defined. Prediction and detection of chemical interactions with living systems are discussed. Chemical pathways in the environment and animals, interactions of chemicals with target molecules, and the metabolic activation of xenobiotics are presented. The prediction of human hazard from animal studies, the relationship of toxicology to radiation biology, and the basic approach to toxicological problems are also discussed. The sections of this book include problems and issues in toxicology; new approaches to testing; chemical threats to health; mechanisms of organ and tissue damage; chemical structure, metabolic pathways and toxicity; and toxicology as a predictive science. Abstracts of papers from this book will appear in appropriate sections of this issue of *Pesticides Abstracts.*

81-0604. Tardiff, R. G. (Natl. Acad. Sci., Washington, DC 20418) **Problems and issues in toxicology.** *Dev. Toxicol. Environ. Sci.* 6: 9-13; 1980.

Various issues concerning the toxicity of substances to which man may be exposed in the environment (including pesticides, consumer goods, food additives and industrial agents) are considered. Particular attention is given to the growth of the chemical industry over the past decades, the diversity of synthetic substances now present in our environment, the need for predictive toxicology testing, the assessment of various hazards and the balancing of risk *vs.* benefit. The susceptibility of various species to certain chemicals and means of equating test results obtained from one species to others are considered.

81-0605. Krieger, R. I. (Dep. Toxicol., Univ. California, Davis, CA 95616) **Toxic substances in retrospect and prospect.** *Dev. Toxicol. Environ. Sci.* 6: 15-22; 1980.

Six presentations are made which deal with the invasion of personal, occupational, community and global environments by toxic substances. Occupational exposure to Kepone (chlordecone) and global contamination with other chlorinated hydrocarbon pesticides are considered. A broad spectrum of events that occurred over the past 40 yr are reviewed; these events form part of the increased development of public, scientific, technical and humanistic understanding of the hazards of chemical contamination. Risk assessment is discussed. It is suggested that scientific studies are needed concerning the manufacture, use and testing of substances. The importance of awareness of the problems involved and of the regulations imposed, and improved communication concerning these problems, is also discussed.

81-0606. Auerbach, S. I.; Gehrs, C. W. (Environ. Sci. Div., Oak Ridge Natl., Lab., Oak Ridge, TN 37830) **Environmental toxicology: issues, problems and challenges.** *Dev. Toxicol. Environ. Sci.* 6: 23-29; 1980 (17 references).

The origins of toxicology and ecology are traced, and the role of these sciences in environmental toxicology is discussed. Ecological approaches to the study of environmental effects are presented. The direct effects of toxicants on organisms and the environment, and the effects of the organism and the environment on the toxicant, are

considered. Population and ecosystem responses must be part of any understanding of the basic ecology and the mechanism of the toxicant involved in an action on the ecosystem. The ability to extrapolate from individuals to populations and ecosystems through the use of simulation models is discussed. This method will allow the utilization of a minimum set of empirical data to estimate the effects of a substance.

81-0607. Epler, J. L.; Winton, W.; Hardigree, A. A.; Larimer, F. W. (Biol. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830) **The appropriate use of genetic toxicology in industry.** *Dev. Toxicol. Environ. Sci.* 6: 45-59; 1980 (67 references).

The use of genetic toxicology in industry is discussed. The predictive value of short-term mutagenicity tests for potential genetic and carcinogenic hazards in the environment are discussed. Classes of chemicals to which humans are exposed include drugs, cosmetics, pesticides, stimulants, food, industrial products and effluents, energy-related effluents and natural products. Various short-term genetic test systems are described, including bacterial systems, fungal systems, plant systems, insect systems and mammalian cell cultures. Advantages and disadvantages of use depending on the test material are presented. Metabolic activation of test compounds is another factor which determines the reliability of any given evaluation system. Resolution, synergism and additivity which arise when complex mixtures of substances are present are considered. Cautions to be exercised when using short-term assays of hazardous materials are discussed briefly.

81-0608. Heidelberger, C. (Compr. Cancer Cent., Univ. South. California, Los Angeles, CA 90033) **Assays for *in vitro* carcinogenesis, initiation, and promotion.** *Dev. Toxicol. Environ. Sci.* 6: 61-67; 1980 (67 references).

Short term assays for carcinogenesis and genetic toxicology are discussed. The Ames test bacterial mutagenicity assay is presented as the prototype of short term carcinogenicity assays. Two types of cell culture systems used to detect carcinogenesis *in vitro* are described. Primary and secondary cultures of Syrian hamster embryo cells have the advantages of a short test time of 10 days and the use of normal cells; however, cloning efficiency is low, the cell population is heterogeneous, and the normal cells have a limited lifespan. The advantages of the use of permanent cloned cell lines (such as mouse embryo fibroblasts) include less subjective scoring; a cloned, homogeneous population; and a high cloning efficiency, which provides the ability to grow large quantities of cells for comparative studies. Disadvantages include the fact that the cells are usually tetraploid (not normal) and that the assay takes about 6 wk to complete. It is suggested that these cell culture systems a have potential for use to prescreen for environmental carcinogens.

81-0609. Norton, S. (Dep. Pharmacol., Med. Cent., Coll. Health Sci. & Hosp., Univ. Kansas, Kansas City, KS 66103) **Behavioral toxicology: a critical appraisal.** *Dev. Toxicol. Environ. Sci.* 6: 91-107; 1980 (57 references).

Behavioral toxicology is a sensitive method for predicting hazard from environmental chemicals. The current knowledge of behavioral toxicology is reviewed, and it is concluded that many simple behaviors can be tested in preweanling rats. However, more information is needed about the usefulness of these tests in relating the findings to prenatal and neonatal exposures to toxic agents. Many of the tests of adult animal behavior have been adapted from psychopharmacology to the field of toxicology. This adaptation has several problems, including the lack of therapeutic categories in toxicology analogous to those of psychopharmacology. The large set of chemical categories present in the field of toxicology make it difficult to validate the behavioral tests. A major factor hindering the successful alignment of the two fields is the failure to tie morphology and biochemistry to behavior through appropriate scientific generalizations. Behavioral tests have the inherent limitation that the CNS is the most adaptable system in the body and can compensate for damage through various mechanisms. Thus tests of structure as well as function are needed to delineate damage from toxic agents.

81-0610. Poland, A.; Glover, E. (McArdle Lab. Cancer Res., Univ. Wisconsin, Madison, WI 53706) **2,3,7,8-Tetrachlorodibenzo-*p*-dioxin: studies on the mechanism of action.** *Dev. Toxicol. Environ. Sci.* 6: 223-239; 1980 (34 references).

Toxicity produced by TCDD is briefly reviewed and an extensive analysis of its mechanism of toxicity is presented. An indirect approach was used to study the toxic mechanism, through examination of the biochemical effects produced by TCDD. Specific effects examined included the genetic expression of AHH activity in inbred strains of mice and the effects on these by 3-methylcholanthrene *vs.* TCDD, the cytosolic binding species, coordinate gene expression, and structure-activity relationships inherent in TCDD toxic action. A model for the mechanism of TCDD toxicity is presented. It is suggested that the toxicity is mediated through the receptor. The initial event in the toxic action is the stereospecific recognition and binding to the cytosolic binding species. The ligand-receptor complex probably controls a battery of genes and the expression (or inhibition) of one or more of these genes, which are coordinately expressed, results in the toxic syndrome. It is suggested to be unlikely that the oncogenesis of TCDD is through covalent binding and somatic mutation.

81-0611. Wilkinson, C. F. (Dep. Entomol., Cornell Univ., Ithaca, NY 14853) **The metabolism of xenobiotics: a study in biochemical evolution.** *Dev. Toxicol. Environ. Sci.* 6: 251-268; 1980 (61 references).

The basic mechanisms by which xenobiotics are oxidized, the characteristics of the cytochrome P-450 mixed function oxidase system, and the evolutionary development of this system are reviewed. The microsomal cytochrome P-450 system of the mammalian liver is primarily responsible for the oxidative metabolism of xenobiotics. The oxidative reactions of the mammalian microsomal liver fraction and the microsomal electron transport pathway are discussed. The phylogenic distribution of mixed function oxidases is considered in detail. Oxidase activity in the organs of different animals is primarily in tissues associated with the major portals of entry of xenobiotics into the body. The oxidase system has been found to have the ability to accept lipophilic foreign compounds, respond rapidly to periods of environmental stress, and also induce many foreign compounds. Enzyme synthesis occurs only when required, and enzyme activity is synchronized with periods of maximum xenobiotic exposure.

81-0612. Guerin, P. M.; Ryan, M. F.* (Dep. Zool., Univ. Coll. Dublin, Dublin 4, Ireland) **Insecticidal effect of trans-2-nonenal, a constituent of carrot root.** *Experientia* 36(12): 1387-1388; 1980 (7 references).

The following amounts of trans-2-nonenal dissolved in chloroform were placed on filter paper discs: 0.05, 0.1, 0.5, 1.0, 2.5, 4.0, 5.0, 7.5, 10.0, and 15.0 mg. Batches of 3rd-instar larvae, still active after dissection from carrot roots and subsequent starvation for 24 hr, were introduced to the jars containing the filter paper discs. Vapor from the trans-2-nonenal induced 100% larval mortality in 24 hr at 15 mg. Vapors from 0.05 mg concentration were ineffective. This is the first demonstration of the insecticidal nature of trans-2-nonenal. The aldehyde form was identified as a component of the essential oil of carrot in concentrations of up to 40 μg/root.

81-0613. Luster, M. I.; Boorman, G. A.; Dean, J. H.; Harris, M. W.; Luebke, R. W.; Padarathsingh, M. L.; Moore, J. A. (NIEHS, Research Triangle Park, NC 27709) **Examination of bone marrow, immunologic parameters and host susceptibility following pre- and postnatal exposure to 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD).** *Int. J. Immunopathol.* 2(4): 301-310; 1980 (44 references).

Studies were performed to determine effects of TCDD exposure on bone marrow, immunologic parameters and host susceptibility in mice. Pregnant mice were administered TCDD by gavage on day 14 of gestation and again on days 1, 7 and 14 following birth. Doses ranged from 1.0 to 15 μg/kg. The 15.0 μg/kg dose proved lethal to 70% of the offspring and toxic to the survivors. Bone marrow hypocellularity and depressed colony formation of macrophage-granulocyte progenitor cells indicated bone mass toxicity at both the 5.0 and 15.0 μg/kg doses. A functional defect of lymphocyte activation appeared to be the cause of depression of lymphoproliferative responses following mitogen stimulation in TCDD immunosuppressive mice. Exposure to TCDD increased the susceptibility to bacterial and tumor challenge.

81-0614. Cremlyn, R. J. (Sch. Nat. Sci., Hatfield Polytech., Hatfield, Hertfordshire, England) **Recent developments in fungicides – a review.** *Int. Pest Control* 22(5): 118-121; 1980 (51 references).

Some newly-developed surface and systemic fungicides are reviewed. It is pointed out that copper, sulfur, and mercury-based fungicides are still used extensively in newer formulations, and some of their uses are considered. The 5 major groups of systemic fungicides are listed, and the recent development of systemic fungicides to control phycomycete fungi (such as grape vine downy mildew and potato blight) is discussed. Among the other systemic fungicides considered are triadimeform, imidazoles, imides, and cyclopropanecarboxylic acids and esters. It is noted that the wide diversity of chemical structures exhibiting fungicidal properties should have considerable potential value in combating the emergence of tolerant strains of fungi.

81-0615. Law, S. E.; Mills, H. A. (Agric. Exp. Stn., Univ. Georgia, Athens, GA 30602) **Electrostatic application of low-volume microbial insecticide spray on broccoli plants.** *J. Am. Soc. Hortic. Sci.* 105(6): 774-777; 1980 (14 references).

The use of electrostatic spray deposition of microbial insecticides is described. The droplet charging capability of the pesticide Thuricide HPC (*Bacillus thuringiensis*) was correlated to the electrical resistivity of the mixture. Thuricide resistivity was linearly related to its dilution in water. Electrostatic and conventional applications, at varying rates, were field tested in a randomized trial. Electrostatic spraying revealed no loss in efficiency of the microbial insecticide compared to conventional methods. Moreover, the efficiency of electrostatic spraying increased, so that quantities of pesticide applied were reduced by 50-66%.

81-0616. Smagula, J. M.; Michaud, M.; Hepler, P. R. (Dep. Plant Soil Sci., Univ. Maine, Orono, ME 04469) **Light and gibberellic acid enhancement of lowbush blueberry seed germination.** *J. Am. Soc. Hortic. Sci.* 105(6): 816-818; 1980 (11 references).

Studies were performed to determine the effects of gibberellic acid (GA) and light on the germination of lowbush blueberry seed. Petri dishes of seeds were treated with 0, 50, 100, 500 and 1000 ppm GA and incubated in an 8-16 hr light-dark cycle or total darkness. A second group of dishes of seeds were exposed to 0, 500, 1000, 2000 and 4000 ppm and incubated in light or dark. GA at 500, 1000,

2000 and 4000 ppm overcame the light requirement and stimulated early germination of seeds in constant dark as well as those that were maintained in an 8-16 hr light-dark cycle. Abnormally curled seedlings with necrotic root tips resulted from treatment with > 1000 ppm GA.

81-0617. Aharoni, Y.; Stewart, J. K.; Guadagni, D. G.; Mon, T. R. (USDA, Fresno, CA 93747) **Thrips mortality and strawberry quality after vacuum fumigation with acetaldehyde or ethyl formate.** *J. Am. Soc. Hortic. Sci.* 105(6): 926-929; 1980 (13 references).

Acetaldehyde and ethyl formate (naturally-occurring compounds which leave no undesirable residues) were studied as possible fumigants for the control of thrips on strawberries. Vacuum fumigation was used because it reduces the exposure time needed. Strawberries were exposed in a metal chamber with pressure reduced to 30 mm Hg. Vapor concentrations of 1.50, 1.75 or 2.00% acetaldehyde were used for 2 or 3 hr, and concentrations of 0.50 or 1.00% ethyl formate were used for 1-2 hr. In other tests, CO_2 was added to the chamber and the pressure increased to 560 mm Hg for the treatment. Sensory evaluations were made, along the determination of thrips mortality and fruit condition. Fumigation at 560 mm Hg for 3 hr with acetaldehyde at 1.75% in 70% CO_2, or by 0.5% ethyl formate at 30 mm Hg for 1 hr, achieved 100% thrip mortality. However, acetaldehyde caused slightly discolored calyxes and imparted a detectable taste for at least 3 days. Ethyl formate had no effect on decay, and affected neither the taste nor odor of the strawberries.

81-0618. Curley, A.; El-Sebae, A. H. (Toxic Eff. Branch, Environ. Toxicol. Div., US EPA, Research Triangle Park, NC 27711) **Introduction.** *J. Environ. Sci. Health B* 15(6): 611-614; 1980.

After World War II, the use of pesticides increased due to improved methods for their organic synthesis. They were most useful in controlling endemic and epidemic diseases transmitted by houseflies and mosquitos. Large scale use of pesticides caused build-up of resistance to chemicals in some parts and caused adverse effects to the environment. Public awareness about hazardous health effects of pesticides began in the early 1960's. The United States formulated the Environmental Protection Agency to deal with pesticide problems as well as other environmental threats. Other developing nations were also importing large amounts of pesticides in the formulated state. Egypt employed imported pesticides against the cotton leafworm and bollworm which resulted in the buildup of multi-resistances in three insect groups. The US established the first international symposium on the *Hazards of Pesticides to the Environment and Human Health* in 1978 which raised many questions that the present symposium seeks to deal with. Those symposium proceedings were directly aimed toward formation of a new policy of environmental safety and human health with regard to pesticide use, with the help of integrated pest control management programs and monitoring schemes. The symposium proceedings are published is this issue of the *Journal of Environmental Science and Health B* and abstracts of papers can be found in the appropriate sections of this issue of *Pesticides Abstracts.*

81-0619. El-Sebae, A. H. (Coll. Agric., Alexandria Univ., Alexandria, Egypt) **Biochemical challenges in future toxicological research.** *J. Environ. Sci. Health B* 15(6): 689-721; 1980 (45 references).

A review of the biochemical challenges in pesticide toxicity research is presented. The development of resistance to pesticides is considered a major problem. Examples of the resistance of many insect species to DDT are cited and the problems associated with finding substitute pesticides for those to which insects have become resistant are enumerated. There is a need to find pesticides that are both environmentally safe and incapable of being cross-resistant with insecticides currently in use. Synergists may be helpful in increasing the efficacy of some pesticides by competing with the active substance at the detoxification sites and thereby limiting the effectiveness of the detoxification system. The effects of impurities, isomers, and metabolic products on the toxic actions of various pesticides are considered. More basic research on the mechanisms of action and selectivity of certain pesticides is required to understand the biochemical processes of toxicity.

81-0620. de la Graviere, B. J. (Author address not given) **Comments on GIFAP.** *J. Environ. Sci. Health B* 15(6): 1111-1114; 1980.

Some comments of the way pesticide decisions are handled in occidental Europe are offered. GIFAP is an international association for pesticide manufacturers centered in Belgium with members from European countries, Brazil, Canada, Japan and the United States. The duties of the 4 GIFAP working groups, technical, economic, informational and transport, are described. GIFAP members take part in international symposia and meetings and also serve as technical advisors in field situations for proper use of pesticides. The Council of Europe is another group which offers regulatory help on pesticide problems. The Council publishes its findings in both French and English and cover toxicology, industry, residues, environment, disposal, packaging and labeling, and classification. The European Economic Community (EEC) is seeking common pesticide registration laws in all participating nations. EEC countries require submission of new data for re-registration of a chemical every 5 or 10 yr, depending on the country.

81-0621. Gyuerk, I. (Author address not given) **Neue Methoden und Einrichtungen zur Herabsetzung des Umweltverunreiningungseinflusses von Beizmitteln. [New methods and equipment for reducing environmental pollution by seed dressing agents.]** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 115-133; 1978 (4 references) (German).

Improved seed dressing technology and equipment to reduce environmental pollution and to increase the quality of seed dressing are described. The loss of seed dressing agents (difference between input and quantity on seeds as sown) is 34-50% with conventional technology, depending on the equipment used. Loss was substantially reduced by pre-moistening the falling seeds with a fine water spray just prior to introduction of the powered seed dressing agent. Air sample analyses revealed considerably lower pesticide dust concentrations around seed dressing machines operating according to the new technology compared with the dry method, especially at distances of 1 m ($\sim$ 10 mg/m^3 vs. $\sim$ 6-36 mg/m^3).

81-0622. Pimental, D.; Andow, D.; Dyson-Hudson, R.; Gallahan, D.; Jacobson, S.; Irish, M.; Kroop, S.; Moss, A.; Schreiner, I.; Shepard, M.; Thompson, T.; Vinzant, B. (New York State Coll. Agric. & Life Sci., Cornell Univ., Ithaca, NY 14853) **Environmental and social costs of pesticides: a preliminary assessment.** *Oikos* 34(2): 126-140; 1980 (166 references).

A preliminary assessment of the environmental and social costs of pesticides in the United States is presented. It was concluded that 45,000 annual pesticide poisoning incidences occurred. Livestock loss was estimated to be $12 million annually. The reduction in natural enemies and pesticide resistance was valued at an annual cost of $287 million. Honey bee poisoning and reduced pollination cost $135 million. Crop and tree loss was estimated at $70 million, and $11 million was lost by reduced fish and wildlife. Miscellaneous losses were estimated at $140 million. It is suggested that the losses reported here represent only a small portion of the total and that further analysis of the indirect costs must be made.

81-0623. Whiteside, T. (Author address not given) **The Pendulum and the Toxic Cloud: The Course of Dioxin Contamination.** *(Yale Univ. Press: New Haven):* 205 pp.; 1979 (173 references).

Various purposes for which 2,4,5-T has been used are discussed and controversies that have arisen regarding these uses are presented. Consideration is given to the disposition by the US Air Force of thousands of canisters containing Agent Orange (2,4-D + 2,4,5-T). Various plans for this disposition are mentioned and reasons for each of the plans eventually not being carried out are discussed. A chapter of the book is devoted to a discussion of the accident at Seveso, Italy, and another describes the current situation in that town. The final chapter discusses implications of exposure to dioxin. In the appendix TCDD and industrial accidents, the evaluation of possible health hazards from TCDD in the environment, morphological changes in monkeys consuming TCDD contaminated feed, and the finding of increased numbers of neoplasms in rats exposed to low level TCDD contamination are considered.

81-0624. Hackman, E. E., III (Author address not given) **Pesticide production.** *Pollut. Technol. Rev.* 40: 148-173; 1978.

Various aspects of pesticides production, including chemical structure of pesticides, manufacturing steps, sources of waste, and treatment of waste are reviewed. The production of a key product in each of 3 classes of pesticides (halogenated organics, phosphorus containing and nitrogen containing) is described. Typical waste load parameters for each class are presented in tabular form. Metallo-organic and botanical and microbiological pesticides are considered in less detail. Current waste control treatment technology is discussed. Treatments considered include chemical destruction, polymeric and other adsorbent treatments, incineration and microbiological treatment. Short case studies are presented of several pesticide production plants, with descriptions of the various waste treatment methods employed. The best practical technology (BPT) model treatment systems developed for each category of pesticides are also presented.

81-0625. Fung, R., ed. (Noyes Data Corp., Park Ridge, NJ 07657) **Protective Barriers for Containment of Toxic Materials.** *Pollut. Technol. Rev.* 67: 288 pp.; 1980.

In this book information on physical methods for the containment of hazardous wastes which comply with the Resource Conservation and Recovery Act of 1976 (RCRA) are presented. Proper storage and handling via the use of liners, covers or fixation techniques are considered. Man-made and natural barrier materials are described. Types of wastes to be contained, testing procedures employed, and the solidification of wastes as a form of stabilization are explored. RCRA and EPA standards, and state regulations, are discussed. Abstracts of chapters from this book will appear in appropriate sections of this issue of *Pesticides Abstracts.*

81-0626. Anonymous **Protective Barriers for Containment of Toxic Materials. RCRA and EPA standards.** *Pollut. Technol. Rev.* 66: 3-11; 1980.

The management of hazardous wastes impounded at surface facilities is discussed. The pollution potential of such an impoundment depends on the site location, com-

position of the wastes to be impounded, design of the facility, management of the facility, and the procedures used to close the facility. Standards in the Resource Conservation and Recovery Act of 1976 regarding the choice of lining material are outlined. Liners may not be materials which are reactant with the material to be impounded. All lining materials must be tested prior to use in the impoundment area. Geological conditions of the area must be considered when choosing a lining material. Soils to be used as liners or natural in-place soil barriers must meet certain standards. In order to prevent rupture of lining materials, all artificial liners must be maintained until closure of the impoundment.

81-0627. Anonymous **Introduction.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 1-44; 1980 (102 references).

This book is a practical manual on 65 priority toxic pollutants (actually reflecting 129 individual compounds). The compounds are presented in alphabetical order by common name. Their characterization and identification, allowable levels, and derivatives or degradation products are discussed. In this introduction, the 65 priority pollutants are listed, along with the 21 industries that the EPA is required to survey. Among the industry categories listed are those involving wood preserving, pesticides and agricultural chemicals. The relationships of toxicity testing to water quality standards and to drinking water standards are considered. Development of criteria for the protection of aquatic life and wildlife, and for the protection of human health is discussed, including criteria development for carcinogens. Toxic effects, exposure, use of extrapolation models, and analytical methods for priority pollutants are also among the topics of discussion.

81-0628. Kovalev, I. E.; Malenkov, A. G. (Dep. Immunopharmacol., Cent. Biol. Test. Chem. Compd., Moscow, USSR) **Potok chuzherodnykh veschestvi vliyanie na chelovechestvo. [Effect of the flow of xenobiotics on mankind.]** *Priroda (Sofia)* 29(9): 90-101; 1980 (6 references) (Russian).

Various aspects of the effect of the flow of xenobiotics on humans are discussed. It is emphasized that xenobiotics, including the insecticides DDT and hexachlorane (BHC), cause induction of microsomal enzymes and thus affect immunochemical homeostasis.

81-0629. Greenhalgh, R. (Chem. & Biol. Res. Inst., Agric. Canada, Ottawa, Ontario K1A OC6, Canada) **Definition of persistence in pesticide chemistry.** *Pure Appl. Chem.* 52(11): 2565-2566; 1980.

An attempt is made to define the term persistence as it is used in pesticide chemistry. The proposed definition is: the residence time of a chemical species in a specifically defined compartment of the environment. The primary factors affecting persistence are the chemical and physical properties of the pesticide, the characteristics of the relevant environmental compartment, and the climatic conditions. Determination of persistence can be expressed in units of time or in units relative to a benchmark.

81-0630. Gunther, F. A.; Ware, G. W.; Foster, R. J.; Knaak, J. B.; Iwata, Y. (Author address not given) **Minimizing occupational exposure to pesticides: summaries and recommendations.** *Residue Rev.* 75: 1-6; 1980.

General and specific conclusions and recommendations resulting from the SRCC-38 Executive Committee special meeting are briefly presented. General conclusions listed pertain to workers involved in manufacturing, formulating and packaging pesticide products; workplace requirements where mixing, loading, and applying of pesticides occurs; general public exposure in agricultural environments; disposal of containers; certification of pesticide applicators; needed research on cumulative effects of pesticides; obtaining dose-response information; correct use of toxicological terminology; closed transfer systems; air-conditioning of cabs on application equipment; quantitative assessment of hazards by public health professionals; good working conditions for employees; residue analytical techniques; and the occurrence of occupational dermatitis. Special recommendations are offered concerning training in recognizing symptoms of poisoning; correct labeling; special risks due to age, sex, diet or medication; gathering of epidemiological data; risks due to chronic exposure; personnel monitoring; use of urinary metabolites for analyzing field assessment studies; testing of cholinesterase levels; techniques for establishing safe levels of foliar residues; federal reentry standards; reliability of analytical methodology; field reentry data; research in closed systems; and worker safety.

81-0631. Davies, J. E.; Freed, V. H.; Enos, H. F.; Barquet, A.; Morgade, C.; Danauskas, J. X. (Dep. Epidemiol. & Public Health, Sch. Med., Univ. Miami, Miami, FL 33136) **Minimizing occupational exposure to pesticides: epidemiological overview.** *Residue Rev.* 75: 7-20; 1980 (3 references).

This report summarizes the workshop held by the Western Regional Coordinating Committee-38 concerning occupational pesticide exposure. Of special concern were the exposures and health effects of the worker which stem from acute and chronic exposure. The population at risk includes the workers engaged in manufacture, application, formulation, mixing and loading, and picking and thinning. With the possibility of male sterility, neurological and renal disease, cancer and teratogenic effects, and behavioral disorders, the health significance of chronic ex-

posure is becoming increasingly important. Assessment of worker exposure has been made using cholinesterase determinations, pesticide residue levels on alpha cellulose pads taped outside and inside worker overalls, residue concentrations on gloves, residue levels in air samples, and in and on foliar and soil samples. Results of studies with mixed or single pesticide exposures are discussed.

81-0632. Foster, D. O.; Zinkel, D. F.; Conner, A. H. (For. Prod. Lab., For. Serv., USDA, Madison, WI 53705) **Tall oil precursors of Douglas fir.** *Tappi* 63(12): 103-105; 1980 (18 references).

The effect of paraquat treatment of southern pines in relation to the quantity of oleoresin produced was investigated. Paraquat treatment results in extensive formation of oleoresin-soaked wood (lightwood). During one study, however, no increase in extracts was found in Douglas firs treated with paraquat. The period following the August treatment was only 7 mo long, however, and occurred during the least physiologically active part of the year for trees. In another study Douglas firs were treated with 0.25, 1, and 5% paraquat solutions and harvested after 20 mo. A zone of dead phloem and associated desiccated wood extended upward from the point of treatment. As the paraquat concentration increased, the affected area of the tree also increased with 5% paraquat treatments producing dead zones extending to about 7 m above treatment levels. Oleoresin soaking of the wood was not noted on visual inspection, but some increase in total extracts was found. The composition was essentially the same as that found in non-treated trees.

81-0633. Rogers, L.; Yopp, J.; Cook, E. E. (Dep. Technol., South. Illinois Univ., Carbondale, IL 62901) **Indicated trends of mercury in aquatic and terrestrial food chains.** *Trans. Ill. State Acad. Sci.* 72(2): 56-63; 1979 (18 references).

Possible contamination of aquatic and terrestrial food chains in Illinois due to mercury in the environment was investigated. Various possible sources of mercury were studied. One possible source was runoff carrying chemicals into aquatic sources. Some of the mercury thus transmitted was present on the land due to past agricultural activities, including seed treatments with mercury compounds. Most of the mercury from this use would be associated with soil components or suspended matter rather than in solution. Mercury, therefore, also becomes part of the sediments in waterways. Much of this mercury is converted into methyl mercury by microorganisms and is assimilated into the food chains. Little is known about mercury levels or trends of accumulation in terrestrial organisms in Illinois. No cases of mercury toxicity in humans have been noted to occur from the consumption of mercury contaminated fish or land animals.

81-0634. Esquivel, O. A.; Albert, L.; Aldana, P. (Univ. Centroamericana Jose Simeon Canas, San Salvador, El Salvador) **Problems de contaminacion y tratamiento de contaminantes. [Problems of contamination and treatment.]** *US NTIS PB Rep.* PB80-175,789: 102 pp.; 1979 (Spanish).

This report is a collection of 5 articles which include: Pesticides in commercial meats in the San Salvador area; Mexican industrialized food contamination by polychlorinated biphenyls residues; Study of the effects of pesticides on workers of cotton plants; The treatment of liquid industrial effluents, studies for the selection of treatment; and Treatment of liquid industrial effluents, an alternative to treatment. Abstracts of articles from this report will appear in the appropriate sections of this issue of *Pesticides Abstracts*. (Author abstract by permission, modified)

81-0635. Albert, L.; Aldana, P. (Cent. Invest. & Estud. Adv., Inst. Polytec. Nac., Mexico City, Mexico) **Contaminacion de alimentos industrializados mexicanos por residuos de policlorobifenilos. [PCB residues in processed food in Mexico.]** *US NTIS PB Rep.* PB80-175,789: pp. 31-45; 1979 (Spanish).

The general hygienic and toxicological aspects of PCBs and the results of PCB residue analyses in food products in Mexico are described. Aroclor 1254 is used illegally as a diluent for pesticide preparations. The toxic effects of PCBs in humans include atrophy and fatty degeneration of the liver, chloracne, fatigue, emesis, and cancer of the pancreas and skin. Residue levels of 0.61-3.37 μg/g were found in cereal products, including 1.68 μg/g in baby food. Levels of 10.4-33.15 μg/g were found in cardboard and plastic packaging materials used for cereal products.

81-0636. Cogley, D. R.; Foy, W. (Walden. Div., Abcor Inc., Wilmington, MA) **Readily available data on 169 compounds associated with operations at Rocky Mountain and Pine Bluff Arsenals.** *US NTIS PB Rep.* PB80-811,532: p. 36; 1980.

Readily available property data have been compiled and analyzed for 169 compounds (including pesticides and insecticides). Included in the study are 153 compounds associated with materials manufactured or handled by the Shell Chemical Company at the Rocky Mountain Arsenal; 10 compounds that have been tentatively identified in surface drainage near the Rocky Mountain Arsenal; and 6 pyrotechnic dyes used at the Pine Bluff Arsenal. Chemical and physical properties of the compounds and information on the toxicity and hazards of the compounds were compiled. (Author abstract by permission)

81-0637. Pollut. Land Use Act. Ref. Group, Int. Joint Comm. US & Canada, Windsor, Ontario, Canada

Environmental management strategy for the Great Lakes System. *US NTIS PB Rep.* PB80-811,532: p. 52; 1980.

This document reports the results of an intensive inquiry conducted by the IJC's International Reference Group on Great Lakes Pollution from Land Use Activities (PLUARG) on pollution of the boundary waters of the Great Lakes System from agricultural, forestry and other land use activities and presents 17 comprehensive recommendations. The Great Lakes are being polluted by land drainage and atmospheric sources as well as municipal and industrial point sources. Phosphorus, sediments, some industrial organics, some previously used pesticides and some heavy metals are identified as land use related pollutants. Soil type, land use intensity and materials added to the land are the most important factors affecting the magnitude of the pollution. (Author abstract by permission)

81-0638. Drury, J. S.; Hammons, A. S. (Oak Ridge Natl. Lab., Oak Ridge, TN) **Investigations of selected environmental pollutants; 1,2-dichloroethane.** *US NTIS PB Rep.* PB80-811,532: p. 65; 1980.

This study is a comprehensive, multidisciplinary review of the health and environmental effects of 1,2-dichloroethane (ethylene dichloride). Other pertinent aspects such as production, use, methods of analysis, and regulatory restrictions are also discussed. Approximately 250 references are cited. 1,2-Dichloroethane is manufactured in greater tonnage than any other chlorinated organic compound; in 1977 nearly 5×10^6 metric tons were synthesized in the United States. It is used primarily as a raw material in the production of vinyl chloride monomer and a few other chlorinated organic compounds. The environment is exposed to this chlorinated hydrocarbon primarily through manufacturing losses. Smaller exposures occur through dispersive uses, such as grain fumigations and application of paints and other coatings, and through storage, distribution, and waste disposal operations. Concentrations of 1,2-dichloroethane in environmental air and water distant from point sources are small - on the order of ppb or less. Concentrations in the environment near point sources are unknown. 1,2-Dichloroethane is toxic to humans, other vertebrates and invertebrates, plants, and microorganisms. It is an established carcinogen in rats and mice exposed by oral intubation and is a weak mutagen in some bacteria and certain grains. (Author abstract by permission)

81-0639. Harrison, E. A. (Author address not given) **Toxicity of gaseous halogenated organic compounds. July 1978-June 1980 (a bibliography with abstracts.).** *US NTIS PB Rep.* PB80-811,532: 85 pp.; 1980.

Subject areas include toxicological studies on halogenated hydrocarbons used as industrial chemicals, fire extinguishers, anesthetics, solvents, pesticides, and aerosol propellants. This updated bibliography contains 77 abstracts, all of which are new entries to the previous edition. Abstracts from this report will appear in appropriate sections of this issue of *Pesticides Abstracts.* (Author abstract by permission)

81-0640. Scanlon, P. F. (Dep. Fish. & Wildl. Sci., Virginia Polytech. Inst., Blacksburg, VA 24061) **Contamination of food chains with particular reference to vertebrates.** *Va. J. Sci.* 30(2): 52; 1979.

Studies have been performed on heavy metals and chlorinated hydrocarbons in efforts to learn about environmental contamination. The movement of contaminants in food chains and the effects of contamination on the reproductive processes and general health of vertebrate species have been examined. Studies have included research on lead as a contaminant of orchards and the management of specific areas for upland game birds. Heavy metals as contaminants in food sources for waterfowl were are studied. Chlorinated hydrocarbon research [PCBs, mirex and Kepone (chlordecone)] has been conducted on healthy as well as undernourished animals.

81-0641. Stsiapanava, E. I.; Dzeeva, V. P. (V. F. Kuprevich Inst. Exp. Bot., Minsk, USSR) **Uplyv khlorkhalinkhlarydu na vugliabodnyi abmen raslin bul'by. [Effect of chlorocholine chloride on carbohydrate metabolism in potato plants.]** *Vestsi Akad. Navuk BSSR Ser. Biyal. Navuk* (5): 15-18; 1980 (14 references) (Belorussian).

The effect of chlorocholine chloride (chlormequat chloride; CCC) on carbohydrate metabolism in potato plants was studied. Plants 20-25 cm tall were treated with CCC at 1.0 μM. Biochemical analyses were conducted 4 and 10 days after application, as well as during the budding phase. CCC was found to increase the level of monosaccharides, sucrose, and starch and to decrease the hydrolytic activity of phosphorylase.

81-0642. Miranenka, A. V.; Shukanov, U. P.; Shipobski, A. K. (V. F. Kuprevich Inst. Exp. Bot., Minsk, USSR) **Uplyv dyalenu i retardantu na bialkovy kompleks pshenitsy. [Effect of Dialene and retardants on protein complexes of wheat.]** *Vestsi Akad. Navuk BSSR Ser. Biyal. Navuk* (5): 19-23; 1980 (11 references) (Belorussian).

The combined effect of the herbicide Dialene and the retardant chlorocholine chloride (CCC; chlormequat chloride) on protein metabolism in wheat was studied. Treatment of wheat crop with Dialene and CCC (4.0 + 0.9 kg/ha) increased the content of protein in the grain by 27%, compared with 9-17% increase after treatment with CCC alone and 22% increase after treatment with Dialene alone.

81-0643. Moseman, R. F.; Oswald, E. O. (Anal. Chem. Div., Radian Corp., Austin, TX 78766) **Development of analytical methodology for assessment of human exposure to pesticides.** *ACS Symp. Ser.* 136(CH13): 251-257; 1980 (24 references).

Measurement of occupational exposure to pesticides can be either direct or indirect. Examples of direct measurement include determination of pesticide levels in the media through which exposure occurred. More commonly indirect measurements are employed including the measure of alkyl phosphate or phenol metabolites in the urine, determination of blood cholinesterase activity, or similar measurements. The difficulties of determination of carbamate pesticide exposure are discussed. N-Dealkyl metabolites of triazine herbicides are traced in the urine as are halogenated anilines resulting from substituted urea herbicides. In methods development research there is a vast difference between recovery of compounds added to a laboratory sample and the recovery of biologically incorporated compounds. The fastest growing technique for determination of trace organics and pesticides is high performance liquid chromatography. Recently the use of electrochemical detectors and a moving belt interface have allowed chemical ionization-mass spectrometric detection.

81-0644. Strzelec, A. (Dep. Agric. Microbiol., Inst. Soil Sci. & Cultiv. Plants, PL-24100 Pulawy, Poland) **The effect of phosphorous on the dynamics of atrazine disappearance from soil and *Penicillium citrinum* culture fluid.** *Acta Microbiol. Pol.* 29(2): 167-171; 1980 (11 references).

Studies were designed to determine the effect of various levels of phosphorous on the rate of disappearance of the herbicide atrazine from soil and from pure culture of *Penicillium citrinum*. Samples of air dried soil (100 g) were mixed with 2 mg of atrazine (50% AI), then phosphorous as K_2HPO_4 and $K_2H_2PO_4$ was added to obtain the equivalent of 0, 40, 60, 80, 120 and 240 kg P/ha. Samples were incubated for 10 wk. Determination of soil pH, total counts of bacteria, actinomycetes and fungi, and determination of atrazine residue by gas chromatography were carried out at 0, 2, 4, 6, 8 and 10 wk. It was determined that addition of phosphorus had no effect on soil pH, only slightly affected the increase of total microorganisms, and inhibited the rate of atrazine disappearance. In another study, 0.5 mg atrazine dissolved in ether was added to flasks containing sterile Czapek medium supplemented with 0, 0.5, 1.0, 1.5, 2.0 and 4.0 g K_2HPO_4/l. After evaporation of the ether, the media was inoculated with *P. citrinum* and incubated for 12 wk. At 2 wk intervals, the dry wt of the mycellium was determined along with atrazine residues in the cultures. No correlation was found between the intensity of *P. citrinum* growth and the rate of atrazine disappearance. In medium without K_2HPO_4, *P. citrinum* growth was very slow and peaked at 168 mg dry wt mycellium after 10 wk. In medium with K_2HPO_4, growth was strong and peaked at 220 mg after 2 wk. The rate of atrazine disappearance decreased with increased phosphorus content. These results may explain the increased s-triazine phytotoxicity and prolonged toxic effect brought about by phosphorus fertilization.

81-0645. Bjerk, J. E.; Brevik, E. M. (Dir. Labor Insp., Olso 1, Norway) **Organochlorine compounds in aquatic environments.** *Arch. Environ. Contam. Toxicol.* 9(6): 743-750; 1980 (10 references).

The body burdens of 5 organochlorine compounds were determined in several marine fishes and invertebrates from 2 localities in Norway. DDE, PCBs, and pentachlorobenzene showed uniform levels, especially on a fat wt basis, while hexachlorobenzene and octachlorostyrene were detected at various levels in the different species. The results are discussed with respect to the concept of accumulation through food chains, and passive position partition of chemicals between water and the organism's fat. Although the results to some extent support the idea of partition, other factors may have a decisive effect on the levels found in the different species. This is true for the bottom dwellers, where magnitude and circumstances of exposure may vary considerably between the different microenvironments. (Author abstract by permission)

81-0646. Lord, K. A.; Helene, C. G.; de Andrea, M. M.; Ruegg, E. F. (Rothamsted Exp. Stn., Harpenden, England) **Sorption and movement of pesticides on thin layer plates of Brazilian soils.** *Arq. Inst. Biol. Sao Paulo* 45(1): 47-52; 1978 (6 references).

Studies were conducted to determine the sorption and movement of pesticides in Brazilian soils. Thin layer soil plates of 7 soil types were treated with lindane, parathion, malathion and carbaryl. Soils with high organic content were generally characterized by high sorption and slow movement. Aldrin and DDT were sorbed much more strongly than the others, and neither moved from the site of application of any of the soil types, indicating that organic content alone did not determine sorption and movement rates. Carbaryl was the least strongly sorbed compound on all 7 soil types. There was variation between the soil types and lindane, parathion and malathion sorption and movement. The results suggest that the behavior of pesticides will vary according to the soil types in the area of application, and the results reported here cannot be applied to soil types other than those used in these studies.

81-0647. Olsen, P.; Settle, H.; Swift, R. (Div. Wildl. Res., CSIRO, Lyneham, A.C.T. 2602, Australia) **Organochlorine residues in wings of ducks in south-eastern Australia.** *Aust. Wildl. Res.* 7(1): 139-147; 1980 (16 references).

Studies were performed to determine general environmental organochlorine contamination by examining

wings of ducks in southeast Australia. Organochlorine levels in wings were compared to other body parts. Tissues from 12 species collected at 10 sites were analyzed for organochlorines. Wings were ground and macerated, extracted, and analyzed by gas liquid chromatography. All wings contained DDT and DDE. No organophosphates were detected. The mean DDT concentrations for male Pacific Black ducks were 42.13 ppm (wing), 2.1 ppm (brain), 10.03 ppm (liver), 331.29 ppm (fat), and 3.43 ppm (breast muscle). Highly significant positive correlations were found between DDT residues in wings and each of the body parts examined. Similar trends were observed for birds collected at various locations. It is suggested that monitoring be conducted to follow changes in organochlorine levels and reveal possible problem areas.

81-0648. Davies, H. A.; Marsh, J. A. P. (Agric. Res. Counc., Weed Res. Organ., Begbroke Hill, Yarnton, Oxford OX5 1PF, England) **Effects of chlorpropham, chlortoluron and isoproturon on respiration and transformation of nitrogen in two soils.** *Bull. Environ. Contam. Toxicol.* 25(5): 706-712; 1980 (12 references).

Soils from arable (Boddington Barn) and permanent grass (Triangle) fields were used in studies designed to determine the possible effects of herbicide use on soil fertility. Moist soil was treated with herbicide (chlorpropham, chlortoluron or isoproturon) to give a final mean concentration of 100 ppm AI calculated on an oven dry basis. The soils were then incubated in polyethylene bags at 23°C for 30 wk. Carbon dioxide evolution was determined weekly. Samples for measurement of mineral nitrogen were taken 0, 1, 3, 5 and 9 wk after herbicide application. Samples for residue analysis were taken every 6 wk. All 3 herbicides increased the CO_2 evolution above the control level. Results on chlorpropham indicated that it was degraded rapidly in the first 6 wk, but that the rate then declined, and 5% of the original amount could still be detected 30 wk after application. Chlorpropham inhibited both nitrification and mineralization of nitrogen for the first 5 wk in Triangle soil, but in Boddington Barn soil, nitrification was inhibited while mineralization of nitrogen was stimulated. Chlortoluron degraded slowly, with 38-48% remaining after 30 wk. The herbicide stimulated nitrogen mineralization in both soils, had no effect on nitrification in Boddington Barn soil, and caused a small inhibition of nitrification in Triangle soil. Isoproturon degraded at a similar rate in both soils, with about 10% remaining after 30 wk. Isoproturon increased mineralization in both soils, and slightly increased nitrification in Triangle soil. It was concluded that the effects of these herbicides on the microbial activities are not important to agriculture.

81-0649. Heinz, G.; Haseltine, S. D.; Hall, R. J.; Krynitsky, A. J. (Patuxent Wildl. Res. Cent., U.S. Fish & Wildl. Serv., Laurel, MD 20811) **Organochlorine and mercury residues in snakes from Pilot and Spider Islands, Lake Michigan – 1978.** *Bull. Environ. Contam. Toxicol.* 25(5): 738-743; 1980 (16 references).

The levels of organochlorine and mercury residues in snakes on Pilot and Spider islands in Lake Michigan were determined. Analyses were performed on 1 water snake and 6 garter snakes. Carcass and stomach contents were analyzed by gas-liquid chromatography for organochlorines. Mercury was analyzed in the vapor phase by atomic absorption. Residues were 0.22-1.6 ppm DDE, non-detectable-0.19 ppm dieldrin, 0.1-0.33. ppm trans-nonachlor, and 1.3-5.8 ppm PCBs. Mercury ranged from 0.24 to 0.45 ppm. The use of snakes and fish-eating birds as biological indicators is discussed. Snakes qualify as good indicators because they are less mobile than birds. However, it is suggested that snakes are less adequate indicators than fish-eating birds because snakes concentrate compounds to a lesser extent.

81-0650. Stanley, J. G.; Trial, J. G. (Maine Coop. Fish. Res. Unit, Univ. Maine, Orono, ME 04469) **Disappearance constants of carbaryl from streams contaminated by forest spraying.** *Bull. Environ. Contam. Toxicol.* 25(5): 771-776; 1980 (21 references).

Studies were conducted to determine disappearance constants of carbaryl from streams that received drift from spraying of nearby forests. Of 18 streams in Maine which had residues of carbaryl after spraying, 9 could be used to calculate disappearance constants because of the occurrence of carbaryl in progressively lesser amounts. The pesticide was applied at 0.83 kg/ha. Water samples were collected and analyzed by gas chromatography. Levels ranged from 0.93 to 7.8 μg/l in brooks and from 0.44 to 2.0 μg/l in rivers. One stream had a maximum concentration of 16 μg/l. Peak concentrations decreased rapidly and followed exponential decay curves. The constants ranged from 0.005 to 0.068 hr^{-1}, and the constants did not vary according to the size of the stream.

81-0651. O'Keeffe, M.; Pierse, C. (Anal. Serv. Lab., Agric. Inst., Dunsinea, Castleknock, Dublin, Ireland) **Exposure of seed pelleting plant workers to methiocarb.** *Bull. Environ. Contam. Toxicol.* 25(5): 777-781; 1980 (9 references).

Studies were performed to determine the level of methiocarb exposure of workers pelletizing a mixture of seed, clay and the carbamate insecticide methiocarb. The atmosphere was sampled by samplers carried on the belts of workers. Air was drawn into the collector at a rate of 1.9 *l*/min and passed through a glass fiber filter disc. The filters were extracted and analyzed for the pesticide by gas chromatography. The average daily levels in the atmosphere ranged from 0.014 to 0.23 mg/m^3. Daily variation in levels was discussed, as was variation due to dif-

ferences in operating procedures. The exposure levels never exceeded those allowed by regulation. Although carbofuran is a better seed protecting agent than methiocarb, it is suggested that exposure to carbofuran at the levels reports for methiocarb would constitute a health hazard.

81-0652. Jones, R. D.; Hood, M. A. (Dep. Biol., Univ. West Florida, FL 32504) **The effects of organophosphorus pesticides on estuarine ammonium oxidizers.** *Can. J. Microbiol.* 26(11): 1296-1299; 1980 (11 references).

The effects of 7 thiophosphorus pesticides [methyl parathion, parathion, EPN, Guthion (azinphos-methyl), fonofos, Abate (temephos) and dicapthon] and their degradation products on estuarine ammonium oxidizers were examined. Using an axenic, closed-culture, high cell density assay, the pesticides caused little inhibition of ammonium oxidation. However, the degradation product of methyl parathion, *p*-aminophenol, significantly inhibited ammonium oxidation at levels as low as 0.01 mg/l. Estuarine sediments containing indigenous ammonium oxidizers were exposed to the pesticides over a 14-day period and activity of the ammonium oxidizers was inhibited after 14 days. Three pesticides were aged in estuarine sediments under aerobic, anaerobic, and microaerophilic conditions, and axenic cultures of ammonium oxidizers were exposed to the resulting metabolites. Ammonium oxidation was inhibited by 10% of the systems containing pesticides aged under aerobic and anaerobic conditions, whereas under microaerophilic conditions, 20% reduction in activity was observed. The data suggest that the parent compounds of the thiophosphorus pesticides have little effect on ammonium oxidation in estuarine sediments, but that certain metabolites which accumulate from the decomposition of these pesticides, especially in sediments under low O_2 levels, may significantly reduce ammonium oxidation. (Author abstract by permission)

81-0653. Spanier, R. (Author address not given) **Groundwater contamination; how big a threat to health?** *Forum Med.* 3(11): 707-710; 1980.

A discussion of the hazards of groundwater pollution is presented. The potential for groundwater contamination is great because of the large amount of chemical wastes disposed in the United States. Although filtration and absorption cleanse some pollutants from percolating water, most chlorinated hydrocarbons (including the persistent pesticides DDT and dibromochloropropane, and the industrial solvent TCE) are not degraded. However, assessment of the extent of groundwater contamination is difficult. The medical profession is directly impacted by the contamination of groundwater because of the effects on public health. It is suggested that physicians should encourage epidemiological efforts in the area of chemical contamination.

81-0654. Anonymous **[Investigation on agricultural pesticide residues.]** *Gyomu Nempo (Annu. Rep. Hiroshima Pref. Agric. Exp. Stn.):* pp. 22-23; 1980 (Japanese).

Residues of the fungicide, *S*-benzyl di-*iso*-propyl phosphorothiolate (IBP), in and on unpolished rice and straw, in water near paddy fields and in paddy field soil were investigated under 32 combined conditions. Residues of the fungicide decreased in unpolished rice with time. In straw, even when applied 60 days before harvest, considerable amounts of the fungicide remained. In paddy soil, 3 days after application, the residues were decreased to less than half of the amount found just after application. In paddy field water, residues 7 days after application were also less than half the amounts found just after application. Residues of IBP in unpolished rice and straw were less in rice plants cultivated in soils to which the pesticide was better absorbed than in soils to which the pesticide was poorly absorbed. The half-life of IBP in the latter soils appeared to be 3 days. Residual amounts of the pesticide in 7 samples of unpolished rice, collected from various areas of Hiroshima prefecture, were all lower than the allowable standard.

81-0655. O'Sullivan, J.; Reyes, A. A. (Hortic. Exp. Stn., Simcoe, Ontario N3Y 4N5, Canada) **Effects of soil fumigation, rotation, and nitrogen on yield, petiole NO_3N, and verticillium wilt of potatoes.** *J. Am. Soc. Hortic. Sci.* 105(6): 809-812; 1980 (12 references).

Studies were performed to determine the effects of soil fumigation with Telone C-17 (dichloropropene + chloropicrin) rotation, and nitrogen on a variety of parameters related to potato production. The experimental design was a split-plot, arranged in a randomized block design, with fumigation and rotation as the main plot treatments and N rates as the sub-plot treatments. Telone C-17 was applied to a depth of 20 cm at a rate of 280 *l*/ha. Nitrogen, as NH_4NO_3, was applied to give N at rates ranging from 0 to 245 kg/ha. Potatoes were either grown continuously or on a 2-yr rotation with corn during 1978 and 1979. NO_3N content in non-fumigated plots was significantly higher than from fumigated plots. Senescence was more severe in non-fumigated plots than in fumigated plots. *Verticullum* was isolated at a higher frequency in non-fumigated, continuous growth plots and lowest in fumigated rotated plots. Fumigation appears to act synergistically with some of the other variables to affect the parameters examined.

81-0656. Hunt, T. W.; Monaco, T. J.; Sheets, T. J. (Pestic. Residue Res. Lab., North Carolina State Univ., Raleigh, NC 27650) **Residue and efficacy studies of alachlor on cabbage and soil.** *J. Am. Soc. Hortic. Sci.* 105(6): 929-932; 1980 (7 references).

Field studies were carried out to determine the effects of the herbicide alachlor on the growth and yield of

cabbage, and to determine alachlor residues in soil and cabbage. The experimental design was randomized complete block with 4 replications. Plots containing newly transplanted cabbages were treated with alachlor at rates of 0, 3.4 and 6.7 kg/ha. Weed control ratings and crop vigor ratings were made. Chromatographic methods were devised for the analysis of alachlor residues in cabbage and soil samples. All cabbage samples were found to contain less than the minimum detectable limit of 0.01 ppm of alachlor. In plots treated with 3.4 kg/ha, soil alachlor residues decreased from 0.72 pm immediately after application to 0.08 ppm after 11 wk. In plots treated with 6.7 kg/ha, residues decreased from 1.58 to 0.10 ppm. Alachlor was found to disappear rapidly from the soil by volatilization and degradation; 80-90% of the alachlor disappeared by 5-7 wk.

81-0657. Dorough, H. W. (Dep. Entomol., Univ. Kentucky, Lexington, KY) **Classification of radioactive pesticide residues in food-producing animals.** *J. Environ. Pathol. Toxicol.* 3(5-6): 11-19; 1980 (24 references).

Criteria for classifying radioactive pesticide residues into 4 categories are discussed. Free metabolites are products of parent molecules formed by phase I reactions, such as dehalogenation, desulfurization or hydrolysis, which have not further reacted. These compounds are generally less active than the parent molecule. Conjugate metabolites are products of secondary metabolism of pesticides with endogenous substrates such as glucuronic acid, sulfate or amino acids. These compounds can be extracted with polar solvents and are often referred to as water soluble metabolites. Bound residues are composed of the products of the bonding of the pesticide, or its metabolites, with cellular components to yield non-endogenous products which cannot be extracted with apolar or polar solvents. The extraction techniques result in subclasses of residues which must be classified. Much greater effort is needed to identify these bound residues and assess their safety to humans. Natural constitutents are normal components of cells, but derive their radioactivity from radio-labeled pesticides. Care must be taken to differentiate natural constitutents from radioactive metabolites.

81-0658. Honeycutt, R. C.; Adler, I. R.; Boka, G.; Secrest, W. L.; Simoneaux, B. J.; Sumner, D. D.; Wargo, J. P. (Res. Lab., Ciba-Geigy Corp., Greensboro, NC) **Incorporation of foreign compound metabolites into plant and soil constituents.** *J. Environ. Pathol. Toxicol.* 3(5-6): 21-33; 1980 (7 references).

Studies were performed to characterize the binding of the metabolites of nitrofen in rice and wheat and profluralin and its metabolites to soil. Nitrofen studies were conducted by isolating starch and lignin from plants treated at 3-4 lb/acre (3.39-4.52 kg/ha) with ^{14}C-nitrofen. In a second study, after treatment of a 3 × 6 ft (0.91 × 1.83 m) plot with 1.5 lb AI/acre (1.7 kg/ha) ^{14}C-profluralin, soil samples were taken 0, 21 and 78 wk. Several types of interactions between pesticides and plant and soil constituents were observed. Lignin and humic acids, as well as other natural constitutents, reacted with the pesticides; the results were high molecular weight, loosely-bound compounds. Pesticides also reacted by hydrogen bonding, which resulted in non-bound, low molecular weight residues. Tightly-bound, high molecular weight residues resulted from covalent binding of pesticides to structural soil components such as humin. This resulted in bound residues. The relationship between the results of these studies and the metabolism of drugs by animals is briefly discussed.

81-0659. Borzelleca, J. F.; Skalsky, H. L. (Dep. Pharmacol., Div. Toxicol., Med. Coll. Virginia, Richmond, VA 23298) **The excretion of pesticides in saliva and its value in assessing exposure.** *J. Environ. Sci. Health B* 15(6): 843-866; 1980 (41 references).

The use of saliva as an indicator of pesticide exposure is discussed. *In vitro* and *in vivo* laboratory animal experiments involving both acute and subchronic exposure to chlordecone and carbaryl showed that both of these compounds could be detected in the saliva only in the first 24 hr after treatment. Urinary clearance of the pesticides was also very rapid. The two compounds were taken up into the saliva glands by passive diffusion as shown by *in vitro* and efflux studies. Uptake of carbaryl and chlordecone stabilized after 1 hr. Efflux rates for carbaryl were 10 times faster than for chlordecone. Levels of carbaryl and its metabolites in blood and saliva were found to be similar while chlordecone was 3-4 fold lower in saliva than in blood. Chlordecone appeared in only trace amounts in the saliva of patients chronically exposed to this pesticide, and it was concluded that blood or urine would serve as better specimens to test for the presence of this insecticide. Saliva may prove to be a useful diagnostic monitoring tool for carbaryl metabolites. Their level of excretion into saliva corresponds to that of plasma; the pattern of cholinesterase inhibition is also similar.

81-0660. Khan, S. U. (Chem. & Biol. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario, Canada) **Determining the role of humic substances in the fate of pesticides in the environment.** *J. Environ. Sci. Health B* 15(6): 1071-1090; 1980 (11 references).

Data are presented which suggest that the behavior and fate of pesticides in the environment are influenced by humic compounds. Methodology commonly employed for characterizing humic substances is outlined. Certain organic compounds become soluble in water in the presence of humic or fulvic acid. Both of these acids have been shown to be involved in the transport of pesticides,

especially DDT, in the soil. Paraquat and diquat adsorption tests show the affinity of humic substances for paraquat. The degradation of many pesticides via nonbiological pathways has been found to be enhanced by humic substances. Studies with atrazine show its chemical degradation in the presence of fulvic acid. The bleaching of humus color from drinking water by chlorination, ozonation, and UV-radiation is discussed. The photochemical stabilities of certain pesticides in aqueous fulvic acid solution when exposed to UV-radiation are also considered.

81-0661. El-Zorgani, G. A. (Agric. Res. Corp., Wad Medini, Sudan) **Residues of organochlorine pesticides in fishes in Sudan.** *J. Environ. Sci. Health B* 15(6): 1091-1098; 1980 (9 references).

Two freshwater irrigation water supply sources, Lake Nubia and the Gezira canals which serve the cotton producing areas of central Sudan, were investigated for pesticide contamination through fish residue studies. Of the 58 fish samples taken from Lake Nubia and analyzed for organochlorine compounds by gas liquid chromatography, only 10 showed detectable levels of insecticides (*p,p'*-DDE in all 10 and ΣDDT in only 3 samples). Residue levels in Lake Nubia fish were low, ranging from 2 to 184 μg/kg. DDT, DDE, and TDE were found in all fish samples from the Gezira canals, with total residue levels ranging from 0.27 to 16 mg/kg. Conspicuously high residue levels (10.6-16 mg/kg) occurred in *Hydrocyon forskalii* fish from the Gezira canals. Evidence of elevated levels of pesticides in these water bodies suggests that continued use of these chemicals in this area may pose a danger to fish and other aquatic fauna.

81-0662. Bansal, O. P.; Goyal, R. N. (Chem. Lab., D. S. Coll., Aligarh 202001, India) **Influence of pesticides on the trace element status of soils (BHC on manganese and iron).** *J. Indian Chem. Soc.* 57(7): 736-739; 1980 (20 references).

Soil was collected from representative areas of Aligarh, India. The application of BHC caused no significant change in pH or electrical conductivity of the soil. Water soluble Mn increased significantly; from 3.2 ppm to 10.7 ppm. It is suggested that the increase in water soluble, available and active Mn may be due to the liberation of Mn from organic matter by the stimulated activity of fumigant resistant bacteria leading to decomposition of the organic matter. The decline in water soluble and exchangeable Mn over time may be due to dissipation of the organic chemical with re-establishment of pesticide sensitive Mn oxidizing bacteria.

81-0663. Yasuno, M.; Hatakeyama, N.; Miyashita, M.; Kasuga, S.; Imamura, N.; Iwakuma, T.; Sugaya, Y. (Natl. Inst. Environ. Stud., Yatabe, Ibaragi, Japan) **[Effects of agricultural chemicals on biota in rivers, ponds and swamps.]** *Kokuritsu Kogai Kenkyusho Nempo (Annu. Rep. Natl. Inst. Environ. Stud.):* pp. 143-144; 1980 (2 references) (Japanese).

The status of phytoplankton, zooplankton, zoobenthics, and nutritive salts in eel-breeding ponds was investigated before and after applying an organophosphorus insecticide for *Thienemaniella* control. The numbers of zooplankton were reduced just after application of the insecticide; the numbers of species and of individuals of phytoplankton showed an increase; and then the numbers of zooplankton increased but with a changed species composition. The application of the insecticide resulted not only in a direct toxic effect but also caused secondary transformations of the pond biota by changing mutualistic relationships among the pond community. In another study the effects of an insecticide applied to a 100 m long artificial waterway were investigated. The primary producers, algae, were exterminated. This caused selective extermination of the primary consumers (a species of caddisfly, red worms, and water fleas) which in turn led to the the abnormal proliferation of algae in the waterway. During recovery, increased species distribution in the upper stream of the waterway and a temporal increase in the numbers of these species was observed.

81-0664. Kangas, J.; Koskinen, A. (Author address not given) **Exposure of Finnish forestry nursery workers to manganese ethylene bisdithiocarbamate (maneb).** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 159-161; 1978 (5 references).

The exposure of Finnish nursery workers to maneb is discussed. Samples were taken from the respiration zones of workers spraying maneb in pine nurseries or those preparing it for spraying. Daily exposures were 0.3 mg/m³ for a tractor driver who prepared the compounds for spraying, but only 0.1 mg/m³ if preparation was performed by other workers. Assistant workers were exposed to 0.1 mg/m³. Workers who separated maneb into bags were exposed to 0.3 mg/m³.

81-0665. Matthey, E. (Author address not given) **Die Durchfuehrung der Lebensmittelkontrolle in der Schweiz im Jahre 1979. I. Bericht des Bundesamtes fuer Gesundheitswesen Abteilung Lebensmittelkontrolle. [Food analysis in Switzerland in 1979. Report of the Federal Office of Public Health, Food Control Division.]** *Mitt. Geb. Lebensmittelunters. Hyg.* 71(3): 267-381; 1980 (Multilingual).

The results of food analysis and inspection in Switzerland in 1979 are presented in an annual report. Total BHC levels have shown a consistent decrease in milk

samples in 1979 compared with the 1978 and 1977 levels. The residue levels found in cheese were 0.04 ppm for ΣBHC, 0.01 ppm for hexachlorobenzene and dieldrin, and 0.02 ppm for ΣDDT (fat basis). The ΣBHC, hexachlorobenzene, heptachlor, heptachlor epoxide, and ΣDDT levels in milled cereal products were below maximum allowable levels. The maximum allowable residue levels were exceeded in 4 of 35 samples of lettuce for quintozene and in 3 of 35 samples for dithiocarbamates. The total BHC, hexachlorobenzene, dieldrin, heptachlor epoxide, and ΣDDT levels were well below the maximum allowable residue levels in dietetic foods. [This article is written in both French and German.]

81-0666. Omiya, J.; Yamaguchi, T.; Kanashima, H. (Numata Kosei Hosp., Numata, Hokkaido, Japan) **[On the significance of detection of pesticides in blood or urine at the first diagnosis of intoxication due to pesticides.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 29(3): 560-561; 1980 (Japanese).

Blood and urine samples were taken in July and August, 1978, from 4 men and 5 women who presented with symptoms apparently caused by agricultural pesticides. The samples were analyzed by gas chromatography. In 2 urine specimens, taken 1 day after application of a mixture of fenthion and edifenphos, fenthion was detected at concentrations of 0.006 and 0.007 ppm, respectively. Serum cholinesterase activities were, correspondingly, 0.81 and 0.23 Δ-pH. Symptoms in these patients were lacrimation, emesis, nausea, and dizziness. In blood and urine samples taken 3-7 days after pesticide application no pesticide residues were detected. The detection of pesticide residues in blood or tissues is significant in the treatment and prognosis of the patient. Since it is difficult to detect all types of pesticides in small hospital laboratories, it is suggested that a collaborative analytical system be established.

81-0667. Nishiyama, K.; Kida, K.; Usuya, S. (Sch. Public Health, Fac. Med., Hirosaki Univ., Hirosaki, Aomori, Japan) **[Examination of methods for the evaluation of inhaled pesticide concentrations.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 29(3): 562-563; 1980 (Japanese).

The accurate measurement of respired amounts of inhaled pesticides was improved by connecting a twin cartridge face-mask to a gas-meter. The apparatus was utilized to determine amounts of inhaled pesticides in 2 field trials; one in an apple orchard where diazinon was being used, and another in a rice paddy where phosmet was being used. The results were compared to data obtained by an impinger collection apparatus. The pesticide was collected on micron-filter pads placed in the face-masks. The collected pesticide was removed from the filter pad by chloroform washing and measured by gas chromatography. The amount of pesticide collected divided by the respiration rate was calculated to be the concentration of respired pesticide. The amount of pesticide collected divided by the time period of application was calculated to be the amount of inhaled pesticide/unit time. Results were generally higher when determined by the filter pad method than when determined by the impinger method. Respired phosmet was 0.914 mg/m³ as determined by the filter pad collection data and 0.952 mg/m³ by impinger collection data. Respired diazinon was calculated to be 0.090 mg/m³ from filter pad data and 0.053 mg/m³ from inpinger collection data.

81-0668. Sasaki, S.; Watabe, K.; Hayashi, S.; Sugaya, H. (Inst. Rural Med., Hiraga Gen. Hosp., Hiraga, Akita, Japan) **[Residues of organochlorine pesticides and PCBs in humans.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 29(3): 564-565; 1980 (Japanese).

The high, low, and mean values and the frequency of organochlorine pesticide residues were calculated from samples of human tissues and breast milk collected in 1979. Residues of β-BHC, *p,p′*-DDE, *p,p′*-DDT, *o,p′*-DDT, ΣDDT, dieldrin, and heptachlor epoxide were determined in 29 breast milk samples, in 18 adipose tissue specimens and in 10 liver, kidney and spleen specimens. In breast milk samples, values ranged from not-detected (nd) for *o,p′*-DDT, dieldrin and heptachlor epoxide to 0.267 ppm (on a whole milk basis) for ΣDDT. In adipose tissue samples, values ranged from nd for *o,p′*-DDT and dieldrin to 11.092 ppm (on a fat basis) for ΣDDT. In organ tissue samples values ranged from nd for *o,p′*-DDT and dieldrin to 8.195 (on a wet wt basis) for ΣDDT. β-BHC concentrations were correlated in adipose tissue and spleen and in liver and kidney. Correlation of *p,p′*-DDE concentrations in adipose tissue and spleen and in adipose tissue and liver were observed. Human residue levels of β-BHC have tended to decrease since 1971. However, this tendency in not observed for ΣDDT levels.

81-0669. Takamatsu, M.; Oki, M.; Yoshizuka, K. (Sch. Environ. Hyg., Fac. Med., Kurume Univ., Kurume, Japan) **[Studies on organochlorine pesticide residues in humans.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 29(3): 566-567; 1980 (Japanese).

Residues of the organochlorine pesticides, β-BHC and ΣDDT, were determined in plasma specimens of 111 farmers from North Kyushu (82), Korea (9), and Kathmandu, Nepal (20), collected from 1978 to 1980. β-BHC was detected in all samples from trace to 34.2 ppb; 94% of the specimens contained < 20 ppb. The levels of β-BHC in Korea and Kathmandu farmers were significantly lower than levels found in farmers from North Kyushu. ΣDDT (*p,p′*-DDT + *p,p′*-DDE) was detected in all samples. Specimens collected from Kathmandu contained > 15 ppb; 2 specimens contained > 200 ppb. In North Kyushu, 77

specimens contained 30 ppb ΣDDT. In order to evaluate past DDT pollution, regional *p,p'*-DDT to *p,p'*-DDE ratios were computed. Ratios were 0.33 for Kathmandu, 0.15-0.27 for North Kyushu and 0.12 for Korea. No significant differences of organochlorine pesticide residues among the 4 districts of North Kyushu were observed. BHC is still being used in parts of Korea. However, β-BHC levels in plasma of farmers of this region were lower than β-BHC plasma levels in North Kyushu farmers.

81-0670. Clark, T.; Loeffler, R. S. T. (Long Ashton Res. Stn., Univ. Bristol, Bristol BS18 9AF, England) **The photolysis of quinomethionate in benzene solution.** *Pestic. Sci.* 11(5): 451-457; 1980 (14 references).

The photolysis of quinomethionate in benzene solution was found to result in complete cleavage of the dithiole ring with loss of both sulfur atoms. Products isolated and identified were those arising from the reaction of intermediate radicals with oxygen and with the solvent. They were identified, by gas chromatography-mass spectrometry and by comparison with authentic samples synthesized by known methods, as 6-methyl-1,2,3,4- tetrahydroquinoxaline-2,3-dione and 6- and 7-methyl-3-phenyl-1,2-dihydroquinoxalin-2-one. A mechanism that accounts for the formation of these products is presented. (Author abstract by permission)

81-0671. Bengston, M.; Connell, M.; Davies, R. A. H.; Desmarchelier, J. M.; Phillips, M. P.; Snelson, J. T.; Sticka, R. (Entomol. Branch, Dep. Primary Ind., Indooroopilly, Queensland 4068, Australia) **Fenitrothion plus (1*R*)-phenothrin, and pirimiphos-methyl plus carbaryl, as grain protectant combinations for wheat.** *Pestic. Sci.* 11(5): 471-482; 1980 (11 references).

Duplicate field trials were carried out on bulk wheat in commercial silos in Queensland and New South Wales. Laboratory bioassays on samples of treated grain at intervals over 9 mo, using malathion-resistant strains of insects, established that treatments were generally effective. Fenitrothion (12 mg/kg) + (1*R*)-phenothrin (2 mg/μg) was more effective than pirimiphos-methyl (6 mg/kg) + carbaryl (10 mg/kg) against *Sitophilus oryzae* (L.). Against *Rhyzopertha dominica* (F.), *Tribolium castaneum* (Herbst), *T. confusum* Jackquelin du Val and *Oryzaephilus surinamensis* (L.), both treatments effectively prevented the production of progeny. The order of persistence was pirimiphos-methyl > (1*R*)-phenothrin > carbaryl or fenitrothion. During processing from wheat to white bread, residues were reduced by 98% for carbaryl, > 44% for (1*R*)-phenothrin, 98% for fenitrothion and 85% for pirimiphos-methyl. (Author abstract by permission)

81-0672. Rouchaud, J.; Moons, C.; Meyer, J. A. (Lab. Phytopathol., Univ. Cathol. Louvain, B-1348 Louvain-la-Neuve, Belgium) **The metabolism of ^{14}C aldicarb in the leaves of sugar beet plants.** *Pestic. Sci.* 11(5): 483-492; 1980 (13 references).

Sugar beet plants were grown in the field, after in-furrow application of [^{14}C]aldicarb (3 kg aldicarb/ha) at planting. The ripe sugar beet plants were harvested, and the blades and petioles of the leaves were analyzed separately. In the whole leaves, 15% of the ^{14}C (all the percentages of ^{14}C are relative to the total ^{14}C incorporated into the whole leaves) was insoluble in ethanol + water (1 + 1 by volume), 31% was organosoluble (and thus unconjugated in the leaves), and 54% was water-soluble (mainly conjugated to plant constituents). The weights and concentrations (as aldicarb equivalents) of various identified metabolites of aldicarb, incorporated into the leaves, were determined; no aldicarb, as such, was detected. (Author abstract by permission)

81-0673. Grayson, B. T. (Shell Biosci. Lab., Shell Res. Ltd., Sittingbourne Res. Cent., Sittingbourne, Kent ME9 8AG, England) **Hydrolysis of cyanazine and related diaminochloro-1,3,5-triazines. Part II. Hydrolysis in sulfuric acid solutions.** *Pestic. Sci.* 11(5): 493-505; 1980 (18 references).

Hydrolysis of cyanazine in sulfuric acid solutions involves primary attack at the nitrile group to give first the corresponding amide and then the carboxylic acid followed subsequently by displacement of the chlorine atom. Comparison of the respective reaction rates showed that, in sulfuric acid solutions (at concentrations around 0.5 *M*) at 25°C, the rate of this attack at the nitrile group is approximately 10 times faster than at the chlorine atom. The kinetic data indicate that in these moderately acid solutions the mechanism of cyanazine hydrolysis corresponds to an A-2 reaction involving prior protonation of the nitrile group followed by rate determining nucleophilic attack by water. However, at higher acidities, the rates decelerate which leads both to diversion from the Zucker-Hammett postulate for simple A-2 reactions and to undue curvature in the Bunnett or Bunnett-Olsen linear free-energy plots, so that with the present data such a conclusion cannot be extended to the reaction in solutions of acidity higher than 0.5 *M*. Removal of the chlorine atom attached to the 1,3,5-triazine ring in atrazine was also found to be an A-2 reaction in moderately acid solutions, but at higher acidities ($[H^+] > 2$ *M*), there is an acceleration in the rate. It is suggested that this is a consequence of diprotonation of the diamino-1,3,5-triazine molecule. (Author abstract by permission)

81-0674. Burns, R. G.; Edwards, J. A. (Biol. Lab., Univ. Kent, Cantebury, Kent CT2 7NJ, England) **Pesticide breakdown by soil enzymes.** *Pestic. Sci.* 11(5): 506-512; 1980 (43 references).

A proportion of natural substrate decay in soil is

effected by extracellular enzymes tenaciously associated with the humic colloids. This indigenous catalytic component (accumulated enzyme) may be involved in pesticide breakdown, particularly the organophosphorus compounds and the acylanilides, and this possibility is considered here. Additionally, guide-lines for detecting and then confirming the presence of accumulated pesticide-degrading enzymes are suggested. (Author abstract by permission)

81-0675. Kimber, R. W. L. (Div. Soils, Commonw. Sci. & Ind. Res. Organ., Glen Osmond, South Australia) **An evaluation of the persistence in soil of two non-chlorinated insecticides analogous to DDT.** *Pestic. Sci.* 11(5): 533-545; 1980 (11 references).

Two insecticides 1,1-bis(4-ethoxyphenyl) -2-nitrobutane (ENB) and 1,1-bis(4-ethoxyphenyl)-2-nitropropane (ENP), at concentrations varying from 0.4-40 mg/kg have been examined for persistence in 3 soils. The proportions of the original compounds recovered decreased rapidly in a clay loam (falling to 50% in 2-6 wk), decreased slowly in a sand (falling to 50% in 16-44 wk) and decreased variably in a heavy clay (falling to 50% in 2-10 wk). After the initial phase, the proportion recovered generally decreased at a slower rate. Breakdown of ENP appeared to proceed via a stepwise oxidation to give 1,1-bis(4-ethoxyphenyl)propan-2-one and 4,4′-diethoxybenzophenone. These products were readily broken down under aerobic conditions and were isolated only from waterlogged or sterile soil. Experiments under sterile conditions indicated that biological breakdown was a major factor and that chemical breakdown was specifically surface-activated. (Author abstract by permission)

81-0676. Misra, S. S.; Awasthi, M. D. (Div. Agric. Chem., Indian Agric. Res. Inst., New Delhi 110012, India) **Residues of systemic insecticides in potatoes.** *Pesticides* 14(8): 12-16; 1980 (19 references).

Studies on the determination of phorate, aldicarb, and oxydemeton-methyl residues on and in potatoes were undertaken. Experimental potato plots were treated with phorate granules, applied near the base of plants at first earth-turning time; oxydemeton-methyl, sprayed on plants at 150, 300 or 400 g AI/ha/spray treatment at 10-12 day intervals; or aldicarb, 1.0 and 1.5 kg AI/ha applied at first earth-turning time of autumn and spring. Quantities of phorate residues were above the tolerance level of 0.5 ppm on or in unwashed and unpeeled as well as from unwashed and peeled potatoes at harvest. The concentrations increased with time from the date of application to harvest. Oxydemeton-methyl residues were within the tolerance limit of 0.2 ppm after 2 or 3 days of the last foliar spray treatment. No detectable quantities of this chemical were found on prepared potatoes. At normal harvest time, 70 days after aldicarb applications to the soil, residues were within tolerance limits on or in unwashed and unpeeled potatoes.

81-0677. Davis, J. E. (Wenatchee Pestic. Res. Branch, US EPA, Wenatchee, WA 98801) **Minimizing occupational exposure to pesticides: personnel monitoring.** *Residue Rev.* 75: 33-50; 1980 (16 references).

Methodology most commonly used for monitoring occupational exposure to pesticides is presented with two objectives in mind. The first objective is to furnish a primer on personnel monitoring for those who are new to this field of investigation. The second is to stimulate the formation of recommendations for further research that will materially improve exposure assessment. A hypothetical pesticide exposure study is followed from selection of appropriate methodology through presentation of results. Airblast application of an orchard cover spray was chosen as the example of a typical study. Emphasis is placed on selection of methodology, validation of methodology, field operations, and standardization of calculations. The advantages and disadvantages of the various methods available for monitoring both dermal and respiratory exposure are discussed. Suggestions based on the author's personal experience are included. These are intended to facilitate the initial exposure study by investigators who have not had experience with this type of research. (Author abstract by permission)

81-0678. Alexander, M. (Dep. Agron., Cornell Univ., Ithaca, NY 14853) **Biodegradation of chemicals of environmental concern.** *Science* 211(4478): 132-138; 1981 (91 references).

Microorganisms in soils and waters convert many synthetic organic chemicals (including DDT, 2,4,5-T, aldrin and heptachlor) to inorganic products. Other compounds are transformed only by cometabolism. These microbial processes may lead to environmental detoxication, the formation of new toxicants, or the biosynthesis of persistent products. Type reactions are proposed for major categories of enzymatic transformation of synthetic chemicals (including insecticides, herbicides and fungicides) in soils, natural waters, and sewage. Some organic molecules are resistant to microbial attack, and explanations for the persistence of such compounds are suggested. (Author abstract by permission)

81-0679. Atlas, E.; Giam, C. S.* (Chem. Dep., Texas A&M Univ., College Station, TX 77843) **Global transport of organic pollutants: ambient concentrations in the remote marine atmosphere.** *Science* 211(4478): 163-165; 1981 (26 references).

Concentrations of organic pollutants in the air and in precipitation have been measured at Enewatak Atoll in

the North Pacific Ocean. These data from a site removed from industrial and human activity indicate the present concentrations of synthetic organic pollutants in the atmosphere and establish the long-range atmospheric transport of organic pollutants to remote marine areas. Hexachlorobenzene and hexachlorocyclohexane (BHC) isomers are present in the remote marine atmosphere. Polychlorobiphenyls, ΣDDT, dieldrin, chlordane, and 2 phthalate ester plasticizers were also found in the samples. The concentrations of pollutants in the atmosphere remote from continental sources are good measures of the minimum concentrations of air pollutants on Earth. (Author abstract by permission)

81-0680. Senesi, N.; Testini, C. (Inst. Chim. Agrar., Univ. Bari, Bari, Italy) **Adsorption of some nitrogenated herbicides by soil humic acids.** *Soil Sci.* 130(6): 314-320; 1980 (26 references).

The adsorption of herbicides by soil humic acids was studied. A 20 mg humus preparation was allowed to equilibrate with 20 mg of herbicide (prometone, methoprotryne, monuron or fenuron) dissolved in 100 ml of distilled water for 72 hr at 18°C. The residue was removed by centrifugation, and the pesticide treatment was repeated twice. After oven drying, the residues were analyzed for C, H, N, O and humic acid content. In all cases, adsorption occurred between the herbicides and the humic acids. The extent of adsorption was higher for s-triazines than for substituted ureas, in the order prometone > methoprotryne > monuron > fenuron. Several possible reasons for the findings are discussed, including differences in pK_a, solubilites, potential for H-bonding and van der Waals interactions.

81-0681. Scheviak, L. A.; Sheets, T. J.; Nelson, L. A. (Pestic. Residue Res. Lab., North Carolina State Univ., Raleigh, NC 27650) **Effects of two curing methods on residues of monocrotophos, acephate, methomyl, and MH on flue-cured tobacco.** *Tob. Int. (NY)* 182(24): 57-61; 1980 (13 references).

The effects of tobacco curing methods on pesticide residues were studied in the field. Tobacco received one spraying of MH (maleic hydrazide) at 2.5 kg/ha and 3 treatments with monocrotophos, acephate or methomyl at 1.12 kg/ha. Leaf samples were collected 10 min after insecticide treatment and again after curing, and analyzed by various methods for pesticide residues. Conventional and bulk curing were both found to reduce pesticide residues. Conventional curing removed 99.6% acephate; 99.8% was removed by bulk curing. Conventional methods removed 94.0% methomyl; 95.2% was lost during bulk curing. Both methods reduced monocrotophos by 99.8%. The percent loss was not determined for MH-treated tobacco, but 77 ppm remained on tobacco cured by both methods.

81-0682. Esquivel, O. A. (Univ. Centroamericana, Jose Simeon Canas, San Salvador, El Salvador) **Analisis de pesticidas en carne comercializada en el municipio de San Salvador. [Pesticide analysis in commercial meat samples in San Salvador.]** *US NTIS PB Rep.* PB80-175,789: pp. 1-30; 1979 (5 references) (Spanish).

Organochlorine pesticide residues were determined in commercial meat samples in El Salvador by gas chromatography. Residue levels were 0.05-0.07 ppm for *o,p'*-DDT, 0.86-0.90 ppm for *p,p'*-DDE, 0.09 ppm for dieldrin, 0.63-0.71 ppm for endrin, 1.11-1.15 ppm for *p,p'*-DDD (*p,p'*-TDE) and 0.28-0.38 ppm for *p,p'*-DDT. Residues levels found were considered to be acceptable, with the exception of endrin.

81-0683. Calderon, G. R. (Cent. Nac. Tecnol. Agropecuaria, El Salvador) **Estudio del efecto de plaguicidas a base de carbamatos y esteres fosforicos en la determinacion de la actividad de colinesterasa en trabajadores involucrados en el manejo de plaguicidas. [Study of the effects of carbamate and organophosphate ester pesticides in the determination of the cholinesterase activity in workers handling pesticides.]** *US NTIS PB Rep.* PB80-175,789: pp. 46-74; 1979 (13 references) (Spanish).

The cholinesterase activity of blood plasma and red blood cell (RBC) cholinesterase were determined by an electrometric method in workers (farm workers, pesticide applicators, material handling crews, quality inspectors) exposed to carbamate and organophosphate ester pesticides before, during, and after pesticide exposure (August, October and January, respectively). Enzyme activities showed no significant changes in the 3 samples from quality inspectors and other white-collar workers. Enzyme activity was significantly higher in the exposed workers before exposure (0.96-1.25 pH/hr in plasma and 0.72-0.91 pH/hr in RBC) than during exposure (0.70-0.80 pH/hr in plasma and 0.56-0.81 pH/hr in RBC). Enzyme activities measured after the exposure were 0.72-0.96 pH/hr in plasma and 0.63-0.64 pH/hr in RBC.

81-0684. Goodson, L. H.; Cage, B. (Midwest Res. Inst., Kansas City, MO) **CAM-4, a portable warning device for organophosphate hazardous material spills.** *US NTIS PB Rep.* PB80-159,494: 59 pp.; 1980 (2 references).

CAM-4 is a completely portable, battery-operated, field version of the earlier cholinesterase antagonist monitor, CAM-1, which senses organophosphates and carbamates in water supplies. The present report describes the design, fabrication, and evaluation of the CAM-4 device. Like CAM-1, this device uses immobilized cholinesterase in an electrochemical cell for the detection of cholinesterase inhibitors in water supplies. CAM-4, however, is not fully automated and therefore requires an operator to observe the cell voltages recorded by the digital printer and to decide whether toxic levels of pesticides have been sampled.

The elimination of automation provided in CAM-1 was a trade-off to provide 8-hr operation from a standard size 12-V automobile battery and to keep the weight and cost of the instrument low. Subtoxic levels of Mesurol (methiocarb), Nemacur (fenamiphos), Baytex (fenthion), DDVP (dichlorvos), Systox (demeton), Furadan (carbofuran) and Sevin (carbaryl) were all detected by CAM-4 at sensitivities comparable to those obtained with CAM-1. (Author abstract by permission)

81-0685. Adams, J. D.; Caro, J. H. (Soil Nitrogen & Environ. Chem. Lab., SEA, Beltsville, MD) **Polyurethane foam as a trapping agent for airborne pesticides: analytical method development.** *US NTIS PB Rep.* PB80-159,502: 83 pp.; 1980 (15 references).

A method for determining levels of organochlorine, organophosphorus, and N-methyl carbamate insecticides in air was developed using 4.4 cm diameter plugs of polyurethane foam as traps and a modified Sherma-Shafik multi-residue procedure for analysis of the foam extracts. With this method, the minimum detectable air concentrations from vapors of 17 of the 18 organochlorine and organophosphorus pesticides tested were ≤ 0.01 ng/m^3. Six carbamate pesticides did not volatilize in sufficient amounts to allow analysis. The experimental program consisted of measurements of efficiency of foam for trapping vapors and aerosols, tests of foam compression during air sampling, evaluations of extraction solvents, evaluations of techniques for extracting pesticide residues from the foam, comparisons of the performance of the ester and ether forms of polyurethane foam, evaluations of the steps in the Sherma-Shafik analytical procedure, evaluations of GLC columns and instrumental parameters, and tests of derivatization procedures for electron-capture gas chromatography of the N-methylcarbamates. A 10-cm depth of foam was found to be an efficient trap for vaporized pesticides. Five-cycle Soxhlet extraction with 1:1 hexane:acetone was the best procedure for removal of pesticides from foam plugs. (Author abstract by permission)

81-0686. Roseboom, D. P.; Evans, R. L.; Hill, T. E. (Illinois State Water Surv., Urbana, IL) **Effect of agriculture on Cedar Lake water quality.** *US NTIS PB Rep.* PB80-164,619: 63 pp.; 1980 (79 references).

This study was made to delineate the type, distribution, and magnitude of orchard-related pesticides in the aquatic environment of Cedar Lake which includes the older impoundments of Little Cedar Lake and the Alto Pass Reservoir. Cedar Lake is a source of water supply for Carbondale, Illinois. The study included analyses for mineral and pesticide content of the soils, water and bottom mud of 3 lakes, and the water and sediments of the 4 major tributaries. In addition, the general limnology and biological characteristics of Cedar Lake were defined, sedimentation surveys of the 2 older lakes were performed, and relevant data regarding pesticide content in fish were evaluated. The results showed that application of pesticides in well-sodded orchards does not pose a serious treat to the water quality of Cedar Lake, but a threat does exist when such orchard lands are converted to row crops, subdivisions, or other uses that destroy the sod cover that minimizes soil erosion. Pesticide residues that make their way by soil movement to the aquatic environment do accumulate in the bottom muds of the lakes, and may become solubilized and thus transferred to the lake waters. (Author abstract by permission)

81-0687. Summers, M. D. (Dep. Entomol., Texas A&M Univ., College Station, TX) **Development and standardization of identification and monitoring techniques for baculovirus pesticides.** *US NTIS PB Rep.* PB80-186,505: 87 pp.; 1980 (55 references).

Biological pesticides, in particular the microbial formulations, are fundamentally different from chemical pesticides in the nature and mode of action of the active agent. The pesticidal action is dependent on the activities of living organisms. Identification, detection and monitoring methods for biological pesticides, because of their nature and characteristics, are divergent from those classically associated with chemical toxicants. Therefore, a new class of standardized, specific and sensitive methods must be developed. One objective of this grant was the development, adaptation and application of specific sensitive diagnostic and clinical techniques for identification, detection and monitoring of viral pesticides. A portion of this research was also committed to study some of the basic biology and characteristics of baculoviruses so that a more thorough understanding of the limitations of the developed monitoring technology would be better understood. This technology can now be applied for the assessment of health and ecological effects, as well as for regulatory concerns. (Author abstract by permission)

81-0688. Evans, W. A. (NIOSH, Cincinnati, OH) **Health hazard evaluation determination report HE 77-73-610, Velsicol Chemical Corporation, St. Louis, Michigan.** *US NTIS PB Rep.* PB80-811,532: p. 2; 1980.

Environmental air samples were taken on June 6 to 8, 1977, at the currently non-operating Velsicol Chemical Corporation facility in St. Louis, Michigan and a medical evaluation of facility employees was conducted between October 17 and 22, 1977. The sampling and medical evaluations were prompted by a request from an authorized employee representative of the Oil, Chemical, and Atomic Workers Union regarding past employee exposures to polybrominated biphenyls and current employee exposures to a variety of chemicals. Sampling results indicate that carbon tetrachloride, ethylene dichloride, benzene, trichlorethylene, total particulates, sulfur dioxide, and am-

monia were either undetected or below OSHA standards. Two measurements of ~ 20-30 ppm (concentration in parts of substance for million parts of air) were recorded for methyl bromide near a halogen detecting bunsen burner. These concentrations exceeded the OSHA standard (15 ppm). Medical evaluation results revealed that facility workers had a high incidence of acneiform skin lesions, probably caused by occupational exposure to halogenated chemicals. Some employees may have suffered adverse health effects upon either their nervous, cardiovascular, hepatic, immune, or respiratory systems. It is recommended that exhaust and ventilation systems be improved and that engineering controls be instituted or improved on all reactors. Workers should be informed of the extent and severity of health effects and those who show evidence of damage to the hepatic, nervous, immune, or hematologic systems should be removed from further exposure to solvents and other toxic materials. (Author abstract by permission)

81-0689. Isensee, A. R.; Yockim, R. S. (SEA, USDA, Beltsville, MD) **Freshwater micro-ecosystem development and testing of substitute chemicals.** *US NTIS PB Rep.* PB80-811,532: p. 15; 1980.

The objective of the study was to develop better techniques for studying pesticides in aquatic model ecosystems. To achieve this objective, a model ecosystem was designed and built that utilizes the continuous dosing, flow-through system, routinely used for chronic fish toxicity testing, in combination with the organisms used in static model ecosystem testing. A previously developed recirculating static model ecosystem (simulating a sediment or erosional pesticide source) was simultaneously used with the flowing water system (simulating an effluent pesticide source) to test the behavior of 3 pesticides [pentachloronitrobenzene (PCNB; quintozene), simazine, and trifluralin]. Conditions in the static system favored pesticide degradation while the flowing system insured continuous pesticide exposure of the organisms. (Author abstract by permission)

81-0690. Everest, J. W. (Auburn Univ., Auburn, AL) **Predicting phosphorus movement and pesticide action in salt marshes with micro-ecosystems.** *US NTIS PB Rep.* PB80-811,532: p. 61; 1980.

Micro-ecosystems of a salt marsh community were designed and established to determine the mechanism by which phosphorus moves through the different physical and biological components of the community, and to determine the effect of the herbicide, fluometuron, in the salt marsh ecosystem. Tidal flow was simulated by connecting a tide machine to the individual micro-ecosystem seawater reservoirs. In the first study, ^{32}P was inserted deep into the mud, and phosphorus movement was monitored at different times in the different biological and physical components. After 4 days significant amounts of ^{32}P were found in the *Spartina alterniflora* leaves and on the soil surface, and appreciable amounts were found in the animal populations by day 8. The second study, using *S. alterniflora* and soil with fiddler crabs, indicated that the burrowing habit of the fiddler crab appeared to cause a rapid turnover of phosphorus from deep within the soil. In the herbicide study the micro-ecosystem was flooded with 100 ppm fluometuron in sea water. Within 30 days almost all plants were killed; *S. alterniflora* of all sizes were equally affected. The herbicide treatment completely prevented the emergence of new shoots from the rhizomes. The herbicide did not significantly affect the condition or number of horse mussels of periwinkle snails. It is concluded that micro-ecosystems can be used to predict pollution effects in the natural marsh ecosystem. (Author abstract by permission)

81-0691. Lores, E. M.; Bradway, D. E.; Moseman, R. F. (Environ. Toxicol. Div., Health Effects Res. Lab., Research Triangle Park, NC) **Organophosphorus pesticide poisonings in humans; determination of residues and metabolites in tissues and urine.** *US NTIS PB Rep.* PB80-811,532: p. 69; 1980.

The analyses of 4 organophosphorus pesticide poisoning cases, 3 of which resulted in death, are reported. The case histories of the subjects, along with the analysis of tissues, urine, and blood for the levels of pesticides and metabolites are given. The pesticides involved include dicrotophos, chlorpyrifos, malathion, and parathion. The methods of analysis were adapted from previously published methods that provide very rapid means of identification or organophosphorus pesticides in tissues or blood of poisoned patients. (Author abstract by permission)

81-0692. Kal'sada, I. N.; Sapegin, D. I.; Severinov, I. S. (Dep. Hyg., Crimean Med. Inst., Simferopol, USSR) **Nakoplenie pestitsidov v gryazevoi zalezhi ozera moinaki. [Accumulation of pesticides in mud deposit of Moinaki lake.]** *Vopr. Kurortol. Fizioter. Lech. Fiz. Kult.* 5: 52-54; 1980 (7 references) (Russian).

The results of determination of pesticide residues in the mud deposit of Moinaki lake (Crimea, USSR) are reported. Moinaki lake is one of the major sources of the mud for balneologic resorts. The lake is located near agricultural fields where organochlorine pesticides [DDT, lindane, and Kelthane (dicofol)] are used widely. A modified chromatographic method of OCP determination was employed. The mud sample (50-100 g) was extracted with hexane and acetone, and the extract was fractionated by thin layer chromatography. A majority of samples were

found to contain residual amounts of OCP. DDT showed the greatest stability. Heating of mud to 55°C resulted in a 10% degradation of lindane and Kelthane, while DDT was thermostable.

See also 81-0602, 81-0603, 81-0606, 81-0618, 81-0621, 81-0622, 81-0624, 81-0627, 81-0629, 81-0630, 81-0631, 81-0633, 81-0634, 81-0635, 81-0638, 81-0639, 81-0693, 81-0701, 81-0702, 81-0703, 81-0706, 81-0707, 81-0711, 81-0728, 81-0729, 81-0731, 81-0733, 81-0737, 81-0739, 81-0743, 81-0748, 81-0783, 81-0810, 81-0812, 81-0813, 81-0814, 81-0815, 81-0816, 81-0817, 81-0818, 81-0819, 81-0820, 81-0821, 81-0822, 81-0823, 81-0824, 81-0825, 81-0826, 81-0827, 81-0828, 81-0829, 81-0830, 81-0831, 81-0832, 81-0833, 81-0862, 81-0865, 81-0871, 81-0876, 81-0887, 81-0895 *and* 81-0897.

81-0693. Klemmer, H. W.; Wong, L.; Sato, M. M.; Reichert, E. L.; Korsak, R. J.; Rashad, M. N. (Hawaii Epidemiol. Stud. Program, Pacific Biomed. Res. Cent., Univ. Hawaii, Honolulu, HI 96822) **Clinical findings in workers exposed to pentachlorophenol.** *Arch. Environ. Contam. Toxicol.* 9(6): 715-725; 1980 (22 references).

Comparative findings are presented on the health and exposure status of groups of individuals in Hawaii with and without occupational exposure to pentachlorophenol (PCP). Occupational exposure to PCP occurred through employment at firms engaged in the treatment of wood with either PCP alone or PCP plus other compounds as preservative chemicals. Mean serum levels were 0.32 ppm for 32 control individuals, 1.72 ppm for 24 workers exposed to PCP and other wood preservative chemicals, and 3.78 ppm for 22 workers exposed to PCP as the sole preservative chemical. Age-standardized prevalence rates were significantly higher among the PCP-exposed than among the controls for low-grade infections or inflammations of the skin and subcutaneous tissue, protective membrane of the eyes and the mucosa membrane of the upper respiratory tract. Strong to moderate statistical associations were observed between PCP exposure and increased occurrence of bands (immature leucocytes) and basophils, increased plasma cholinesterase, alkaline phosphatase, gamma globulin and uric acid, and decreased serum calcium. Despite these statistical associations, laboratory values considered to be clinically abnormal were few and not significantly greater in occurrence among the PCP-exposed individuals. (Author abstract by permission)

81-0694. Gannon, J. F. (Boston Coll., Chestnut Hill, MA) **FIFRA and the taking of trade secrets.** *Boston Coll. Environ. Aff. Law Rev.* 8(3): 593-639; 1980 (235 references).

The passage of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires manufacturers wanting to market a pesticide to submit data demonstrating the safety and efficacy of the product to a regulatory agency for approval. However, FIFRA contained no provision for the protection of trade secrets until 1972. Prior to this time the US EPA generally held data submitted as confidential. Recent amendments have authorized EPA to use data submitted by one company in registering another company's product. Pesticide manufacturers maintain that this is in violation of their property rights. This article reviews FIFRA statutory changes which have precipitated the present controversy and outlines the arguments presented in the *Amchem Products Co. vs. Costle* litigation. The powers of Congress under the Commerce Clause, and the traditional distinctions between compensable and non-compensable governmental actions are also reviewed.

81-0695. Anonymous **Dow study finds 2,4,5-T no pregnancy risk.** *Chem. Eng. News* 59(1): 6; 1981.

Results of a study based on a questionnaire sent to 700 wives of employees of Dow Chemical Co., Michigan, indicate that offspring of production workers exposed to 2,4,5-T and associated dioxin did not exhibit adverse effects from this exposure. No significant differences in birth defect rates were observed for the control group women (345) and the exposed group women (370). However, there was a significantly lower incidence of conception among wives of production workers possibly exposed to TCDD.

81-0696. Kahuho, S. K. (Dep. Surg., Univ. Nairobi, Nairobi, Kenya) **Occasional report: drug poisoning in the intensive care unit, Kenyatta National Hospital.** *East Afr. Med. J.* 57(7): 490-494; 1980 (12 references).

Case histories of 72 poisoning patients in a Kenya hospital between August 1972 and April 1978 are presented. The most common type of poisoning involved organophosphorus substances; 24 incidents were reported, 11 of which were fatal. General supportive therapy for poison victims is described, along with specific antidotes. For organophosphorus poisons, atropine and PAM are administered.

81-0697. Sutherland, S. (SEA Inf. Staff, Washington, DC) **Extension trains pesticide applicators.** *Ext. Rev.* 51(3): 10-13; 1980.

An overview is presented of the state Cooperative Extension Service training program for commercial and private pesticide applicators. Programs are based on standards set by the EPA, and each state program is subject to EPA approval. Recertification training is also required for certified applicators. The programs in use in five states (representing different geographic areas) are described. North Carolina has a 4-yr training session covering 8 topics; from 1974 to 1979 more than 8000 licensed commercial applicators and pesticide dealers were trained. This program was the first to be assessed for the effectiveness of its format, and areas in which training was most successful and least successful are listed. The New York program consists of self study of the core manual, and a 4-hr class. Nevada has devised a self-teaching presentation with slides and sound. The state of Hawaii found the material provided for use in other states to be of limited value, and held a planning workshop to create supplementary materials. Hawaii currently has a 6-hr course for private applicators and a 16-20 hr course for commercial applicators. In Indiana, training material is presented based on the needs of county farmers and the chemicals used in various parts of the state. Training for commercial applicators involves 3 days, and certification is valid for 3 yr.

81-0698. Demidenko, N. M.; Izmailova, G. D.; Musamukhamedov, S. R.; Shamirzaev, N. Kh. (Med. In-

st., Tashkent, USSR) **Obosnovanie pdk dipiridilfosfata v vozdukhe rabochei zony. [Substantiation of MPC of dipyridylphosphate in the air of working zone.]** *Gig. Tr. Prof. Zabol.* (9): 48-50; 1980 (5 references) (Russian).

In an effort to substantiate the maximum permissible concentration (MPC) of the herbicide dipyridylphosphate (DPP) in the air of the working zone, parameters of acute and chronic toxicity were studied in albino rats, mice, and rabbits. Single administrations of DPP (po and sc) had marked local effects on skin and eye mucosa. The LD50 was 240-295 mg/kg after po administration and 404-460 mg/kg after local application. Chronic exposure of animals to DPP by inhalation (10.2 mg/m^3, 4 hr/day, 5x/wk, for 4 mo) induced marked changes in the process of oogenesis and spermatogenesis as well as the morphological changes of internal organs. DPP at 1.1 mg/m^3 was ineffective. These findings indicated that 1.1 mg/m^3 can be considered as the threshold of chronic effect; 0.1 mg/m^3 is recommended as the MPC of DPP in the air of the working zone.

81-0699. Prival, M. J. (Genet. Toxicol. Branch, US FDA, Washington, DC 20204) **Genetic toxicology: regulatory aspects.** *J. Environ. Pathol. Toxicol.* 3(5-6): 99-111; 1980 (44 references).

A review of the regulatory aspects of genetic toxicology is presented. Tests to screen chemicals for potential carcinogenicity and tests that determine if a chemical can induce hereditary alterations in exposed humans are discussed. Tests for heritable effects, conducted by the government, were begun in 1977 by the HEW Welfare Working Group on Mutagenicity Testing. This group recommended screening of chemicals, but only a few chemicals were screened each year. Proposals of the working group were not regulatory in nature; they were an attempt to formulate policies. There are now two proposals to require industry to perform genetic testing, both contained in EPA Guidelines for Registering Pesticides, and Proposed Hazardous Wastes Guidelines and Regulations. Carcinogenicity was discussed and several case histories were presented. The regulations involved in this area do not require short-term testing; however, results of some short-term tests may eventually serve as the basis for long-term testing. The Food, Drug and Cosmetic Act allows use of carcinogenic chemicals in food-producing animals as long as the chemicals are not toxic and residues can not be detected in processed tissues.

81-0700. Wodicka, V. O. (1307 Norman Place, Fullerton, CA 92631) **Evaluating the safety of food constituents.** *J. Environ. Pathol. Toxicol.* 3(5-6): 139-147; 1980 (1 reference).

A system for evaluating the safety of food constituents (including natural components, additives, contaminants, pesticides and bacterial toxins) has been proposed by the Scientific Committee for the Food Safety Council. The procedure includes acute toxicity testing, followed by mutagenesis, metabolism, and pharmacokinetic studies. Subacute testing, including teratogenic and reproductive effects, and chronic toxicity tests are then performed. The dose-response relationships are determined for all effects by mathematical models. Recent findings of high levels of lead, polychlorinated biphenyls, polybrominated biphenyls, aflatoxins, and other toxins in the environment are described in this study.

81-0701. Isa, A. L. (Minist. Agric., Cairo, Egypt) **Pesticide regulations in Egypt to avoid hazards to the environment and human health.** *J. Environ. Sci. Health B* 15(6): 615-624; 1980.

In Egypt, major challenges in protecting crop yield are created by the two cotton pests *Spodoptera littoralis* (the cotton leafworm) and *Pectinophera gossypiella* (the pink bollworm). DDT was found to be effective against these insects, but it caused deleterious effects on beneficial insects and the environment. Measures to minimize the use of pesticides include timing of applications with pupae emergence, hand removal of egg masses, heat-killing the hibernated pink bollworms, and selective spraying of the injury-level areas with first priority. Pesticide regulations in Egypt require import and marketing of pesticides only through state companies, and proper labeling and packaging. The Ministry of Agriculture published booklets of regulations for protection against the hazards of pesticide toxicity and issues regulations for safe handling and application of pesticides. The Egypt Ministry of Health determines toxicity of all pesticides currently in use and handles the health monitoring of exposed workers and analysis of residue levels in food. Procedures for obtaining 5-yr registrations of agricultural pesticides in Egypt are presented.

81-0702. El-Gamal, A. (Minist. Health, Cairo, Egypt) **Legislative aspects of pesticide regulations in Egypt.** *J. Environ. Sci. Health B* 15(6): 625-631; 1980.

The argument for continued use of agricultural pesticides in Egypt is very strong, although indiscriminate use of these chemicals at levels of 10^3 tons/yr has taken its toll upon the environment. Many workers engaged in pesticide spraying show symptoms of chronic intoxication. Airplane crashes have occurred due to the effects of pesticides on serum cholinesterase levels in pilots; these effects result in blurred vision and headaches. The number of pesticide poisoning incidents have doubled over the past 10 yr. In analysis tests conducted by the US EPA, lindane, ΣDDT and leptophos residues were detected in human adipose tissues of poisoning victims and in farm house dust. Lack of worker training and carelessness play an important part in many of these poisoning incidents. Egyptian Law of Agriculture Number 53, passed in 1966, con-

tains sections regulating pesticide registration, importation, handling, manufacturing, preparation, selling and sampling. Other laws specify safety conditions for the home and workplace for the use of pesticides. The Egyptian Ministry of Health has called for legislation requiring pesticides to be tested for human safety before they are registered by the Ministry of Agriculture. The proposed law also emphasizes reregistration of mixtures to test for possible synergistic effects.

81-0703. El-Khishen, S. A. (Plant Prot. Dep., Alexandria Univ., Alexandria, Egypt) **Legislative aspects of pesticide regulations.** *J. Environ. Sci. Health B* 15(6): 633-644; 1980.

After use of pesticides increased, scientists were faced with problems of pest resistance, health hazards due to pesticides, adverse effects on non-target insects and contamination of the environment. Early attempts at pesticide registration proved inadequate because they accounted only for the safe use of the product as directed and not for the subsequent ecological impact of the chemical. In developed countries, the use of certain pesticides was banned until the product could comply with more stringent regulations. Legislation of pesticide use requires cooperative efforts of lawyers, scientists and administrators to determine structural, chemical, and biological properties of the compounds, as well as the scope of efficacy, residue data, toxicology and special safety requirements. Several measures for effective legislation on the introduction and use of pesticides on international and local scales are outlined. Conflicts in interest arise when consumers want inexpensive uncontaminated food and a clean protected environment and farmers seek high performance agricultural chemicals with good return on investment. International programs of pesticide regulation will require negotiations among all interested groups of different countries.

81-0704. Patton, D. E. (Off. Gen. Counsel, US EPA, Washington, DC 20460) **Legal aspects of pesticides and toxic substances testing requirements.** *J. Environ. Sci. Health B* 15(6): 645-663; 1980.

The safety of pesticides and other chemicals which present a risk to human health are evaluated under the laws and programs of the US EPA. The EPA relies upon standard testing procedures to evaluate pesticides for health effects. The legislative bodies emphasize use of reasoned regulatory decisions in relation to these EPA evaluations. In general, the US Congress decides how much authority the EPA will have in regulating pesticides. EPA conducts testing programs in accordance with the powers imparted to it by Congress and then formulates regulatory laws and for each chemical. The US courts review each EPA decision and challenge these regulations when legally necessary. In order to determine the registration status of a pesticide, the EPA is given the authority to conduct toxicity testing. In order for the courts to review the EPA's decisions based on test data, test procedures must be strictly standardized and accurate. For this reason sound test methodology is not only important scientifically; it is vital from a legal standpoint as well.

81-0705. Ross, R. T. (Off. Adm., Agric. Res., SEA, USDA, Washington, DC 20250) **Statute and legislative history of the Federal Insecticide, Fungicide, and Rodenticide Act and its impact on agriculture.** *J. Environ. Sci. Health B* 15(6): 665-676; 1980.

Regulations and laws for proper use of pesticides are necessary for the safety of society. Many pesticide registrations are being cancelled as pesticide standards are being tightened. Close cooperation among regulatory agencies, pesticide manufacturers, and users is needed as the process of pesticide regulation becomes more complex. It is the responsibility of governments to enact laws that safeguard the health and safety of the people. The Federal Insecticide, Fungicide and Rodenticide Act of 1947 is concerned with marketing aspects of pesticides while the Federal Food, Drug, and Cosmetic Act of 1948 protects human health from hazards of chemical products. In 1970, the US EPA was established to aid in handling the growing public concern over pesticide abuse. The enactment of the Federal Environmental Pesticide Control Act in 1972 gave the EPA the authority to register pesticides. The US Department of Agriculture submits all efficacy data to EPA so it may make accurate benefit/risk analyses of each product. Pesticide regulations vary from country to country and pesticide residue levels in food imports and exports may not always be universally acceptable. Many international agencies such as the World Health Organization, the Food and Agriculture Organization, and the Codex Alimentarius Commission have been instrumental in the establishment of international regulatory networks for the control of pesticide levels in food.

81-0706. Sallam, M.; El-Ghawaby, S. H. (Natl. Inst. Occup. Saf. & Health, Cairo, Egypt) **Safety in the use of pesticides.** *J. Environ. Sci. Health B* 15(6): 677-681; 1980.

In Egypt, pesticides were the cause of three epidemiological and environmental disasters during the last decade. In 1971, several thousands of livestock were poisoned by the misuse of Phosvel (leptophos). In 1976, about 3000 agricultural workers were adversely affected by a combination of Tamaron (methamidophos) and Gusathion (azinphos-methyl). In 1979, Lannate (methomyl) poisoning was the cause of death in 30 workers and illness in ~ 4000 more. It was suggested that the Egyptian Ministries of Agriculture, Health and Manpower should take action to regulate the use of pesticides and monitor their effects on health and the environment. Precautionary measures for pesticide workers should include use of protective clothing, proper handling of

pesticides and frequent medical examinations. The creation of a specialized safety service headed by an agricultural engineer was recommended to educate pesticide workers through safety campaigns and films.

81-0707. Copplestone, J. F. (Pestic. Dev. & Safe Use Unit., Div. Vector Biol. & Control, WHO, Geneva, Switzerland) **Safety testing of pesticides and methods of evaluating human exposure in the field.** *J. Environ. Sci. Health B* 15(6): 683-688; 1980 (4 references).

Testing of pesticides for safety may be divided into toxicity testing and evaluations of potential hazards to man and the environment. The latter parameters are harder to assess because they depend upon the conditions of pesticide use in a particular environment. Acute hazards of pesticide exposure are of concern to developing nations where agricultural pesticides are used in great quantities. Pesticide intoxication usually occurs from misuse in handling or use without proper protection. Definitions of hazard from normal use may vary from one location to the next due to factors of climate, dress, agricultural practices, operator training, and availability of protective clothing. Field studies for the collection of baseline data are very helpful in evaluation of the health effects of pesticides. Data of this type already exist for some organophosphorus insecticides. Other studies indicate certain types of dress may provide adequate protection against dimethoate adsorption through the skin. Other effective methods of reducing exposure include protection by distance, protection by limitations of time or quantity, and protection by personal hygiene such as washing the skin after pesticide exposure. WHO recommendations have to be implemented by national authorities and an adequate body of data is required to evaluate the effects of protective measures that are implemented.

81-0708. Hayes, W. J., Jr. (Cent. Environ. Toxicol., Sch. Med., Vanderbilt Univ., Nashville, TN 37232) **Factors limiting injury from pesticides.** *J. Environ. Sci. Health B* 15(6): 1005-1021; 1980.

Measures which would reduce the number of injuries related to pesticide exposure from intentional and accidental causes are discussed. The circumstances under which pesticides cause injury are reviewed. The single most important factor in the safe use of pesticides is proper labeling of hazardous products. Vital statistics from various nations were used to determine which pesticides and what conditions were most frequently associated with poisoning fatalities. Proper use by farmers offers the best protection against handling accidents and ensures safe residue levels in crops sold at the markets. The adoption of protective practices and devices by pesticide workers and the education and training of the public are vital to the safe use of pesticides. Regulation of pesticides by government agencies is also necessary to limit personal injury and damage to the environment. Because of their wide range of experience, international agencies may provide a good source of practical advice on the safe use of pesticides.

81-0709. Anonymous **Final recommendations by combined U.S. and Egyptian representatives.** *J. Environ. Sci. Health B* 15(6): 1107-1109; 1980.

Twelve final recommendations to aid in the safe use of pesticides were made by representatives of both the United States and Egypt. The recommendations stress strict registration procedures requiring evaluation of available toxicology data by both manufacturers and government agencies. United Nations agencies should seek international agreement on pesticide regulations. New formulations should be treated as new pesticides and be subject to all normal registration requirements. Pesticide formulations should be as pure and stable as possible; normal field use of the product should not cause phytotoxicity or decreases in crop yield. Reregistration of products should be required every 5 yr to allow for new toxicological findings. The development of non-chemical methods of pest control are stressed as well as the training and education of workers in the proper use of chemical pesticides. The cooperation of Egyptian and American Scientific institutions was also suggested to solve mutual problems regarding pesticides.

81-0710. Adamis, Z.; Szenzenstein, M. (Author address not given) **Berufsvergiftungen in der Landwirtschaft. [Occupational poisonings in agriculture.]** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 9-13; 1978 (3 references) (German).

Statistical data are presented on occupational pesticide poisonings in Hungary during the period 1971-1976. A total of 803 occupational poisonings were reported. The causative agent was organochlorine pesticides in 9 cases, organophosphorus pesticides in 389, carbamate insecticides in 20, composite insecticides in 7, nicotine insecticides in 7, other insecticides in 2, herbicides in 221, fungicides in 94, rodenticides in 4, fumigants in 9, and other pesticides in 41. Hospitalization was necessary in 1 of 9 cases after poisoning with organochlorine insecticides, in 207 of 389 cases for organophosphorus insecticides, in 11 of 20 cases for composite insecticides, in 4 of 7 cases for nicotine insecticides, in 1 of 2 cases for other insecticides, in 53 of 221 cases for herbicides, in 47 of 94 cases for fungicides, in 3 of 4 cases for rodenticides, in 4 of 9 cases for fumigants, and in 10 of 41 cases after poisonings with other pesticides. All fatal poisonings were caused by organophosphorus preparations [Phosdrin (mevinphos) in 5 cases and unidentified organophosphate ester insecticides in 2]. The circumstances of the poisoning were analyzed in 346 cases; 18 subjects were exposed during spraying, 144 after spraying, 51 performed spraying without protective clothing, 50 were working in sprayed areas within the re-

quired waiting time, 18 were exposed during material handling, mixing, and machine repair, 16 were poisoned by inhalation, and 49 were exposed under unknown circumstances.

81-0711. Barath, M.; Olah, I.; Pavletits, O. (Author address not given) **Aspects of safety technique in the production of WP type herbicides in powder form.** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 23-30; 1978 (3 references).

Several aspects of the safety of WP (wettable powder) type herbicides are discussed. Safety precautions for worker safety, air pollution control and toxicological research are considered. The results of chromosome tests made during the development of the herbicide Buvinol 50 WP [20% Klorinol (TCPE) and 25% Aktinit PK (atrazine)] are presented. Indirect exposures via air pollution are suggested to cause chromatid and unstable chromosome aberrations. Atmospheric concentrations in a Buvinol manufacturing plant were measured, and occupational exposure levels were calculated.

81-0712. Dombay, Z.; Farkasdy, J. (Author address not given) **Sicherheitstechnische und Betriebssanitatswesenprobleme der Propachlor und propachlor enthaltenden Pflanzenschutzmittel. [Problems of safety technique and of occupational safety as related to propachlor and its formulations.]** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 49-58; 1978 (German).

The hygienic problems of propachlor and its formulations (Satecid 65 WP, Satecid AT-1 and Cartex-M) are discussed. Results of examinations of workers engaged in the production of these preparations are presented. The recommended waiting time between treatment and return to work is 14 days. The maximum allowable propachlor residue concentration in food products is 0.1 mg/kg. The oral LD50 of Satecid 65 WP in rats is 3200 mg/kg. Seventy-nine workers engaged in Satecid production at a chemical plant were examined dermatologically. Of these workers, 56% were symptom-free; 19% had dermatitis attributable to propachlor; and 25% had other skin diseases. Chloracne was not seen. In epicutaneous tests, performed on 67 workers, monovalent or bivalent hypersensitivity was observed in 12. Skin tests with propachlor (0.01%) were positive in 1 of 67 cases that showed transformation of dermatitis into chronic eczema. Photo-patch tests, performed in 28 cases, were negative in all cases, which eliminated the possibility of a photosensitizing effect for propachlor.

81-0713. Erdos, G.; Koncz, A.; Vamos, G. (Author address not given) **Aktuelle Sicherheitstechnische Fragen der Verwendung von Giftgasen. [Current safety problems of the use of toxic gases as fumigants.]** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 59-70; 1978 (German).

Safety problems concerning the use of fumigants (hydrogen cyanide, hydrogen phosphide, methyl bromide, and ethylene oxide) in agriculture and other areas are discussed. Fumigation with hydrogen phosphide represents practically no toxic hazard because of the delayed release of the gas. Ethylene oxide is especially suitable for fumigation of food, because it is insoluble in liquids and lipids. Hydrogen cyanide is unsuitable for fumigation of foods with high water content because of its solubility in water. Methyl bromide is adsorbed on fumigated materials, which may make ventilation for several days necessary. All poisonings with fumigants in Hungary have been due to lack of compliance with safety regulations.

81-0714. Fabry, J. (Author address not given) **Die mit der Planung von Kunstduenger und Pflanzenschutzmittellagern in den Landwirtschaftlichen Produktionsbetrieben Zusammenhaengenden Sicherheitstechnischen Fragen. [Safety problems of fertilizer and pesticide depots on cooperative farms.]** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Techoinform: Budapest); pp. 71-77; 1978 (8 references) (German).

Regulations and recommendations concerning the storage of fertilizers and pesticides and the disposal of packaging materials in Hungary are described. The width of the protective zone between pesticide warehouses and objects requiring protection (houses) is recommended to be 200-500 m. The allowed distance between such warehouses and water wells is 50 m. Packaging containing pesticides should be emptied completely, and the packaging materials must be compacted and buried at a depth of 50 cm and at a minimum distance of 100 m from wells, natural waters, residential areas, houses and useful plants. Combustible packaging materials can be incinerated and the ashes buried.

81-0715. Fuzesi, I. F.; Susan, M. (Author address not given) **Das DDVP-Durchlassvermoegen von Schutzhandschuhen, Schutzkleidern und sonsitigen Schutzschichten. [The permeability of DDVP to protective gloves, protective clothing, and other protective layers.]** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 79-91; 1978 (6 references) (German).

The rates of diffusion of DDVP (dichlorvos) through various materials and layers used for protection in gloves, workclothes and containers, were studied in a Weber apparatus. The solution concentration was 0.15%. Neither protective gloves nor polyethylene foils offered ab-

solute protection against DDVP, but the rate of diffusion was much lower for fabrics coated with polyethylene foil (10-20 μg/cm² after 30-50 min) than for fabrics impregnated with Pergetol and silicone. The permeability of fabrics impregnated with Pergetol and silicone increased rapidly with the number of washings. The diffusion rate reached about 4 μg/cm² after 240 min in some gloves, but was 1 μg/cm² in foil-coated gloves. Xylene used as a solvent increased the diffusion of DDVP through a bottle made of Hostalen.

81-0716. Gyapai, J. (Author address not given) **The dangers of drying and grinding processes during manufacture of biologically active plant protective agents in enclosed technological equipment.** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 103-114; 1978 (10 references).

A report is presented on the potential hazard of explosion resulting from grinding and drying steps in pesticide processing. The various types of processing techniques are reviewed. Particle sizes are discussed; the most hazardous particle types are 2-40 μ, micronized materials. An analysis of 100 dust explosions in Hungary is presented. From this, protective measures are derived. The principle recommendations include reduction of explosion pressure to atmospheric pressure, rating to explosion pressure, situation of equipment outside buildings, exclusion of the source of ignition, and damping explosions.

81-0717. Josepovits, G. (Author address not given) **Die Moeglichkeiten der Neutralisierung von Pflanzenschutmittelabfaellen. [Possibilities to neutralize pesticide wastes.]** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 145-157; 1978 (4 references) (German).

Due to the restrictions on the application of land disposal and dilution as methods for the disposal of pesticide wastes and pesticide-contaminated wastwaters, chemical neutralization and detoxification of such wastes is increasingly required. Seed-dressing agents, including organomercurials, can be neutralized by treatment with excess amounts of sodium sulfide and subsequent acidification of the solution with diluted hydrochloric acid. The mercury sulfide formed is dried and covered with earth. Oxyquinoline sulfate is mixed with copper vitriol, after which the copper ions are alkalized with calcium hydroxide solution for precipitation. Wastes containing dimethoate, phorate, demeton-S-methyl, demephion and phosphamidon can be neutralized by adding excess amounts of sodium hydroxide solution. Wastes containing DNOC, dinoseb or dinoterb can by the addition of sodium hydroxide and iron(II) sulfate solutions.

81-0718. Varnagy, L. (Agric. Chem. Cent., Szigetvar, Hungary) **Die Gesundheitsschutzpraktisierung der Agrarchemisierung in der Zentrale fuer Agrochemie in Szigetvar. [Practice of health protection in connection with the use of farm chemicals at the Szigetvar Agrochemical Center.]** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 283-290; 1978 (German).

Health protection and environmental protection in the Szigetvar, Hungary, agricultural region is described. Centralized washing of pesticide-contaminated workclothes has been organized to protect the workers and their families. The handling of pesticides is mechanized to avoid any direct contact of the workers with the preparations. Pesticides not toxic to bees are used to protect them and other beneficial insects. Beekeepers are also notified of pesticide applications. Pesticide-contaminated wastewaters are stored in open settling tanks for 15 days before transfer to liquid manure pits.

81-0719. Wolff, F.; Loeser, F. (Author addresses not given) **Aktuelle Sicherheitstechnische Fragen beim Betrieb von Tieftemperature-, guelle, and siloanlagen. [Current safety problems in connection with the operation of cold storage, liquid manure, and silo installations.]** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 291-299; 1978 (German).

The causes of accidents and poisonings in farm workers in the Neubrandenburg area of East Germany are analyzed. There were 42 accidental poisonings of farm workers during the period 1957-1976. The cause of poisoning was organophosphate pesticides in 9 cases, PH_3 (hydrogen phosphide) in 7, organomercurial seed-dressing agents in 2 (one fatal case), DNOC in 9, DDT and BHC in 6, hydrogen sulfide in 3, and carbon monoxide in 6. Allergic contact eczema was diagnosed in 246 cases during the same periods. The causative agent included insecticides and herbicides in 26 cases and wood preservatives in 4.

81-0720. Zsifkov, T. (Author address not given) **Geltendmachung der sicherheitstechnischen Gesichtspunkte des landwirtschaftlichen Chemisierens in der ungarischen Normung. [Application of safety principles of agricultural chemicals use in Hungarian standardization.]** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 312-317; 1978 (German).

Safety techniques concerning agrochemical preparations and agricultural materials (pesticides, wastewaters, liquid manure, fertilizers) in Hungary are discussed. Pesticides are approved in licensing documents

issued by the Ministry of Food and Agriculture. These documents may contain the poison symbol, data on necessary waiting periods, mode of packaging, labeling, recommended application technology and toxicological data (LD values).

81-0721. Baughman, R. W. (Author address not given) **TCDD and industrial accidents.** In: *The Pendulum and the Toxic Cloud. The Course of Dioxin Contamination.* Whiteside, T. (Yale Univ. Press: New Haven): pp. 145-158; 1979 (31 references).

Chloracne was first used as a term in 1899 to describe a condition prevalent among workers producing chlorine by electrolysis. The condition probably arose from exposure to chlorinated aromatic compounds formed by the action of the chlorine on tar used to protect the electrolysis towers. A new and more potent source of chloracne was found in the 1950's with increases in the production and processing of chlorophenols. Several cases had been noted as early as 1936 in workers treating wood with a fungicidal chlorophenol formation, Dowicide H, containing mainly tetrachlorophenol. After the herbicidal properties of 2,4,5-T and related phenoxyacetic acids were discovered, new cases of chloracne were found. There were other symptoms of exposure including pains in the skeletal muscles, shortness of breath, intolerance to cold, palpable and tender liver, loss of sensation in the extremities, demyelination of peripheral nerves, fatigue, nervousness, irritability, insomnia, loss of libido and vertigo. Tests eventually showed that 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) was an extraordinarily potent chloracnegen. Severe liver and kidney damage were also associated with TCDD exposure. Death from intestinal sarcoma was attributed to TCDD exposure in one worker. It is noted through cases of exposure that the effects of exposure on a person can last many years and that dioxin residues can persist inside a chemical plant environment for at least 5 yr.

81-0722. Messelson, M.; O'Keefe, P.; Baughman, R. (Author address not given) **The evaluation of possible health hazards from TCDD in the environment.** In: *The Pendulum and the Toxic Cloud. The Course of Dioxin Contamination.* Whiteside, T. (Yale Univ. Press: New Haven): pp. 159-167; 1979 (9 references).

TCDD is present as a contaminant in certain pesticides, including the herbicides 2,4,5-T and silvex. Analysis of animal and milk fat is extremely important in attempts to determine how much TCDD is reaching various human populations. High resolution mass spectrometry is particularly well suited for measurement of low levels of TCDD. TCDD peaks as they are recorded by mass spectrometry during analysis of beef fat and bovine milk samples are given. In efforts to evaluate TCDD contamination, 14 fat samples were taken from cattle and submitted for analysis. TCDD was present in 11 of the samples from cattle that had grazed on a 2,4,5-T treated rangeland. No TCDD was present in cattle grazed on untreated land. The 4 most highly contaminated samples contained 70, 24, 20 and 12 ppt, respectively. This indicates a significant association between the use of 2,4,5-T and TCDD contamination of beef fat. Analysis of human milk samples from 18 women living in areas where 2,4,5-T is used on rangeland gave 4 positive samples; tests on 6 women living in areas with no 2,4,5-T exposure gave no positive results. The lethal level for chronic TCDD exposure in monkeys is < 500 ppt in the diet.

81-0723. Anonymous **Protective Barriers for Containment of Toxic Materials. Liner types.** *Pollut. Technol. Rev.* 66: 29-61; 1980 (38 references).

Various types of materials useful as barriers for impoundment of hazardous liquids and sludges are reviewed. The lining materials vary in permeability, durability and cost with selection depending on the characters of the waste to be stored, soil conditions, materials available, performance needed, and design of the pond. Industrial wastes considered for impoundment include sludges and other wastes from the petroleum, steel, electroplating, pesticide formulation, oil refining, pharmaceutical, rubber and plastics industries. General properties of flexible membrane liners are given for polyvinyl chloride, polyethylene, polypropylene, butyl rubber, chlorinated polyethylene, ethylene propylene rubber, chlorosulfonated polyethylene, and neoprene. Specifics are also given for asphalt concrete, bituminous seal, soil asphalt, sprayed asphalt membranes, rubber latex, soil cement, soil bentonite and compacted clays. Liners for landfill leachate control are also considered.

81-0724. Anonymous **Protective Barriers for Containment of Toxic Materials. Wastes.** *Pollut. Technol. Rev.* 66: 62-76; 1980 (7 references).

Basic chemical components of major industrial waste categories are considered. These categories include: caustic petroleum sludge, oily refinery sludge, acidic steel-pickling waste, heavy metal-bearing electroplating sludge, toxic pesticide formulation waste, toxic pharmaceutical waste and wastes from rubber and plastics industries. The major source of contaminated wastewater from pesticide formulating plants is the periodic cleanup of formulation lines including filling equipment, which is carried out to prevent cross-contamination of one product with another. Liquid formulation lines are cleaned most frequently. The nature of wastewater contaminants includes dissolved organics and suspended and dissolved solids. In addition to cleanup wastewater, other contamination arises from spill washdown, drum washing, air pollution control devices and area runoff.

81-0725. Anonymous **Protective Barriers for Containment of Toxic Materials. Testing of liners.** *Pollut. Technol. Rev.* 66: 77-126; 1980 (9 references).

The selection of liner material for impoundment sites must begin with a study of the characteristics of the prospective wastes. Tests must be made to determine the effects of that waste on the liner material. A project is described which was designed to determine the effects of exposure to several hazardous materials on various liners; to determine the durability of synthetic membranes, admixed materials, and natural soils as liners; to estimate effective lives of 12 materials; to develop information needed for selecting liner materials; and to develop methods for assessing the relative merit of different materials. One material tested was a herbicide, (predominantly water with a minor amount of clay or talc as solid carrier). This type of waste has a minimum aggressive character with respect to the linings. Properties of various lining materials and results of tests with each are listed. The testing of liners for landfill use includes the immersion of membrane liners in leachate and an analysis of results of any interaction which develops. Water vapor permeability, osmotic bag test, water absorption tests, and seepage through liners in leachate generators, all must be considered in choosing the lining material.

81-0726. Liska, D.; Kolesar, D. (Inst. Prev. Med., Bratislava, Czechoslovakia) **Prispevok k toxikologickej klasifikacii pesticidov. [Contribution to the toxicological classification of pesticides.]** *Prac. Lek.* 32(8): 264-270; 1980 (16 references) (Slovak).

A Czechoslovakian proposal for classifying pesticides on the basis of acute toxicity, skin irritability, skin toxicity (absorption) and the coefficient of accumulation and chronic effect (presumed chronic risk) is presented as a supplement to the existing WHO classification system. Pesticides are separated into 5 classes on the basis of acute toxicity, 4 on the basis of skin irritability, and 3 based on skin toxicity; presumed chronic risk is introduced as a new criterion. The proposal assigns a weight factor to individual criteria which in some cases alters the overall assessment of toxicity and hazard of certain pesticides compared with the WHO classification. The proposal has more classes than the WHO system. The Czechoslovakian proposal also differentiates between risk and toxicity, which is not the case in some national interpretations (French, English) of the WHO system.

81-0727. Kilgore, W. W.; Akesson, N. B. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Minimizing occupational exposure to pesticides: populations at exposure risk.** *Residue Rev.* 75: 21-31; 1980 (6 references).

Routes of exposure and reported illnesses due to exposure to synthetic organic pesticides are discussed. Eight groups of workers occupationally exposed to pesticides are considered. It is concluded that synthetic organic pesticides, when used properly, have been of tremendous benefit to man and his environment; but when misused or used carelessly, they have caused considerable harm. Fortunately, these adverse effects have been relatively minor in comparison to the great benefit from pest control. Thus, there is little doubt that pesticides have played, and most likely will continue to play, an important role in the production of food and fiber as the world's supply of raw agricultural products begins to decline in proportion to the projected increase in population. Clearly, from now on, all pest control programs employing pesticides or bioenvironmental measures will continue to be assessed by the public on the basis of three important criteria – economics, environmental pollution, and public health. (Author abstract by permission, modified)

81-0728. Vandekar, M. (Pestic. Dev. & Safe Use, Div. Vector Biol. & Control, WHO, Geneva, Switzerland) **Minimizing occupational exposure to pesticides: cholinesterase determination and organophosphorus poisoning.** *Residue Rev.* 75: 67-80; 1980 (42 references).

The nature of the reaction of organophosphorus and carbamate insecticides with cholinesterase is outlined. The rates of both reactivation and aging of the inhibited enzyme differ for different groups of organophosphorus compounds and are the main determining factors on which depend the proportion of the irreversibly inhibited enzyme formed during prolonged exposure to insecticide. The level of erythrocyte cholinesterase is a better indicator of acetylcholinesterase activity at nerve synapses than that of plasma. The determination of erythrocyte cholinesterase, or of whole blood cholinesterase using methods in which the activity measured is predominantly contributed by erythrocyte cholinesterase, is preferable. The results of research carried out in WHO collaborating laboratories and of field studies on cholinesterase monitoring are described. At present the tintometric and Ellman spectrophotometric methods are those most used in WHO field trials. Monitoring of cholinesterase in malaria spraymen in the course of WHO field trials of new insecticides has proved invaluable for assessing a compound's potential for the cumulation of inhibition, for deciding when an operator should be withdrawn from further exposure to an anticholinesterase insecticide, and for making comparisons with other compounds. Thus, as a result of weekly cholinesterase determination in a 2 yr trial with fenitrothion, 2-3 out of 35-40 spraymen had to be withdrawn from spraying during each 2 mo round of spraying and in this way no complaints attributable to exposure to the insecticide were recorded in a total of 1500 man-days of work. For erythrocyte cholinesterase, 70% activity has been recommended as an action level by both WHO and the Subcommittee on Pesticides, Permanent Commission and International Association on Occupational Health. Several factors which can interfere with the accuracy of

results are mentioned. (Author abstract by permission, abridged)

81-0729. Knaak, J. B. (California Dep. Food & Agric., Sacramento, CA 95814) **Minimizing occupational exposure to pesticides: techniques for establishing safe levels of foliar residues.** *Residue Rev.* 75: 81-96; 1980 (32 references).

The California Department of Agriculture in 1971 established reentry intervals for organophosphate pesticides on tree and vine crops to protect workers from exposure to pesticide residues. The reentry intervals were established without a knowledge of the factors associated with the dissipation of residues, exposure to residues, and their dermal toxicities. Since the adoption of the first reentry intervals, foliar dissipation studies have elucidated the events which occur after the application of a pesticide. The formation of toxic oxons on foliage was considered the principal reason for the illnesses observed in field workers. The Federal Task Group on reentry in 1974 recommended field studies involving workers as a means of setting reentry intervals. Studies conducted in California led to the publication of a protocol for conducting these studies. Ethical questions, inadequate funding, and a limited number of investigators available to conduct these studies suggested a new approach to setting reentry intervals. It was proposed that safe pesticide levels be established on foliage. The safe level concept lends itself to the orderly development of exposure and toxicity data as well as a table relating pesticide application rates on crops to their initial dislodgeable residues, half-lives in days, safe levels, and reentry intervals. Safe levels may be established on foliage using the results of dermal dose-ChE response studies, dermal dose-behavior response studies, field reentry studies, and dermal absorption studies. (Author abstract by permission)

81-0730. Zweig, G.; Adams, J. D.; Blondell, J. (US EPA, Washington, DC 20460) **Minimizing occupational exposure to pesticides: federal reentry standards for farm workers (present and proposed).** *Residue Rev.* 75: 103-112; 1980 (23 references).

This paper reviews the development of federal reentry standards for the protection of farm workers entering areas that have been treated with toxic pesticides. The first codified reentry standards were proposed by OSHA of the Department of Labor but were superseded by abbreviated minimum standards promulgated by the EPA in 1974 which this Agency urged states to lengthen as required by use practices and climatic conditions as appropriate. California state reentry standards are in some cases stricter than Federal standards. EPA is now about to formally propose new data requirements for registrants of pesticides for which reentry dates must be established. The EPA and university scientists have proposed several methods to establish reentry standards with and without human monitoring. All methods involve residue dissipation studies, toxicologic studies, and exposure assessment. All of the proposed methods must be field monitored to determine that the calculated dates are realistic and, at the same time, protective to the reentering farm worker. (Author abstract by permission)

81-0731. Iwata, Y. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Minimizing occupational exposure to pesticides: reentry field data – a recapitulation.** *Residue Rev.* 75: 127-147; 1980 (13 references).

After an insecticide application has been made to a crop, toxic persisting residues remain. These residues are potentially hazardous to the health of agricultural workers who come into contact with them. The consensus is that dermal exposure is the most important pathway by which toxicants enter the body. The exposure results from contact with toxicant-bearing dusts which are resident on foliar surfaces and on the dry surface dust of treated fields. Protocols and considerations to be kept in mind when conducting experiments for collecting residue data relevant to worker safety are discussed. Examples of available residue data are presented. It is stressed that residue data by themselves are not useful and that toxicological data are needed to indicate if levels present are indeed of toxicological significance. Approaches to minimizing worker exposure such as reentry waiting intervals, use of protective disposable clothing, and use of on-site residue determinations prior to worker entry into a treated field are discussed. (Author abstract by permission)

81-0732. Carman, G. E. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Minimizing occupational exposure to pesticides: closed systems and worker safety.** *Residue Rev.* 75: 149-158; 1980 (3 references).

Conclusions from a study of the feasibility of using closed systems to minimize occupational exposure during the application of pesticides are presented. A closed system would allow the transfer of a pesticide formulation from the shipping and/or marketing container into the dilution media without worker exposure and with in-line provisions for quantifying the extent of the transfer. The past developments in this field of closed system applications are reviewed and the initial regulations attempting to make it not only desirable, but legally binding, to use closed systems for pesticide users handling the more toxic materials are described. Merits and disadvantages to using the closed system are discussed. Advantages lie mainly in the avoidance of worker exposures during the mixing-loading operations. Other advantages include increased accuracy in measuring, total elimination of spillage losses, lack of fill-site contamination, lessening water source contamination, and avoiding the problem of shipping container disposal. Difficulties arise with the inability to detect

unacceptable formulations that can be done during hand pouring, use of substances that cannot be premixed, errors in sequence or procedure may be irreversible, and problems concerning malfunctions. Continued research into the use of more simplified closed systems, retaining the increased safety to the workers, and avoiding complications due to equipment failures, is also suggested.

81-0733. Freed, V. H.; Davies, J. E.; Peters, L. J.; Parveen, F. (Dep. Agric. Chem., Oregon State Univ., Corvallis, OR 97331) **Minimizing occupational exposure to pesticides: repellency and penetrability of treated textiles to pesticide sprays.** *Residue Rev.* 75: 159-167; 1980 (7 references).

The repellency effectiveness of several fluoroaliphatic resins is reported in efforts to further safeguard workers from exposure to pesticides. Direct spraying of pesticides in emulsion form on treated and untreated cloth samples was used. The effect of heat on the repellency of the chemicals was also tested. Possible skin absorption was measured using cellulose sentinel pads. The cloth used in the study was 100% cotton or 65:35% polyester:cotton denim. Chlorpyrifos, used to test pesticide penetration, was applied as an emulsion containing 2 lb chemical/50 gal water (0.336 kg/l). Penetration abilities of chlorpyrifos, dinoseb, chlorpropham, and pentachlorophenol (PCP) were also measured. Treated textiles were repellent to pesticide sprays. Aqueous-based fluoroaliphatic resins offered better repellency than solvent-based ones; 74% and 63% repellency, respectively. Heat treatments after spraying with solvent based formulations improved some resins' repellency appreciably. The type of fabric was also a significant factor.

81-0734. Beamer, W. H.; Leng, M. L. (Health & Environ. Serv., Dow Chem. Co., Midland, MI 48640) **Minimizing occupational exposure to pesticides: worker safety, industrial viewpoint.** *Residue Rev.* 75: 169-183; 1980 (3 references).

The costs of safety precautions to minimize exposure of field workers to pesticides is dependent upon the specific set of circumstances such as the physical and toxic properties of the specific pesticide, the job being performed, the experience level of the workers involved, and weather conditions during the operations. The manufacturer carries out a large number of research studies to determine the properties of the pesticide and its formulations. An appreciable fraction of this work is used to provide information on safe handling and use of the material. The information is supplied on labels and in technical bulletins and product brochures. Only the visible benefits of safe work practices, such as avoidance of lost work days due to injury or illness, can be assessed. We have no way to quantify the personal burden of illness or injury even on a short-term basis. The essential elements of the employer's responsibility are worker education and training, protective equipment, and developing safe work practices. The worker is responsible for recognition of the possible hazards, the practice of prescribed safe work procedures, and personal hygiene. (Author abstract by permission)

81-0735. Japanese Society of Industrial Health, Tokyo, Japan **[Recommended allowable concentration of parathion.]** *Sangyo Igaku (Jpn. J. Ind. Health)* 22: 421-439; 1980 (17 references) (Japanese).

Maximum allowable concentrations (MAC) are the highest concentrations of a substance present in ambient air at which no harmful effects are observed in most humans. The Japanese government issued the recommended MAC for parathion in May, 1980, and it is now 0.1 mg/m^3. This has been the MAC for parathion since 1961. Recent publications which are the basis for the continuation of this MAC for parathion are reviewed.

81-0736. Hazard Eval. & Tech. Assist. Branch, NIOSH, Cincinnati, OH **Health hazard evaluation determination report: No. HE 79-108-647, Mobil Chemical Co., Mt. Pleasant, Tennessee.** *US NTIS PB Rep.* PB80-163,306: 17 pp.; 1979 (6 references).

Laboratory technicians at the Mobil Chemical Company, Mt. Pleasant, Tennessee, were exposed to vapors from herbicides (merphos, bifenox and ethoprop) that were being released into a quality control laboratory from gas chromatograph exhaust ports at the plant. Laboratory personnel were interviewed and laboratory ventilation systems were evaluated. No adverse health effects were noted in any of the laboratory personnel, and general laboratory ventilation was considered adequate. (Author abstract by permission)

81-0737. Little, L. W.; Zweidinger, R. A.; Monig, E. C.; Fith, W. J. (Research Triangle Inst., Research Triangle Park, NC) **Treatment technology for pesticide manufacturing effluents: atrazine, maneb, MSMA, and oryzalin.** *US NTIS PB Rep.* PB80-173,941: 280 pp.; 1980 (194 references).

The report gives results of laboratory and pilot studies of the treatability of wastewaters generated by the manufacture of the pesticides maneb, oryzalin, atrazine, and MSMA. Wastewaters were characterized for pesticide content, routine parameters, and toxicity to fish, algae, and activated sludge organisms. Biological treatment was evaluated in terms of ability of pilot activated sludge systems to be successful on mixtures of municipal and pesticide wastewaters and to remove the pesticide and other toxic materials. Ability of activated carbon to treat wastewaters was determined by adsorption isotherm tests and by granular activated carbon column tests. Study

results showed that atrazine, oryzalin, and maneb wastes could be treated successfully with activated carbon, although such treatment had potentially high costs. Oryzalin waste disrupted biological treatment. Atrazine and MSMA waste did not disrupt biological treatment, but pesticide concentrations were not reduced by biological treatment. Maneb concentrations were reduced by biological treatment. Additional work is needed to determine fate of breakdown products from biological treatment of maneb wastewaters. (Author abstract by permission)

81-0738. JRB Assoc. Inc., McLean, VA **Special occupational hazard review for aldrin/dieldrin.** *US NTIS PB Rep.* PB80-811,532: p. 51; 1980.

The review on aldrin/dieldrin toxicity and a companion document prepared for DDT serve as comprehensive reports on the 3 most representative compounds of the organochlorine insecticides. Although aldrin and dieldrin are no longer produced in the United States, they may still have some restricted uses including; subsurface ground insertion for termite control, dipping of non-food roots and tops, and mothproofing by using closed-system manufacturing processes. Though the uses of aldrin and dieldrin are banned in many countries, they are still manufactured in Europe and are used throughout the world for public health purposes. Based on demonstrated potentials for tumor induction in rats and mice by aldrin and dieldrin, NIOSH recommends that workplace environmental limits no higher than 0.15 mg/m^3 be established for both compounds. The recommended exposure limit is the lowest concentration detectable by the current NIOSH validated sampling and analytical methods (NIOSH Methods S275 and S283). Workers should also avoid skin contact with aldrin and dieldrin, as these pesticides can be absorbed through the skin particularly when they are dissolved in organic solvents. (Author abstract by permission)

81-0739. US EPA, Washington, DC **Toxaphene: ambient water quality.** *US NTIS PB Rep.* PB80-811,532: p. 53; 1980.

Section 304(a) of the Clean Water Act requires EPA to publish and periodically update water quality criteria. These criteria are to reflect the latest scientific knowledge on the identifiable effects of pollutants on public health and welfare, aquatic life, and recreation. This report presents water quality criteria for toxaphene. It presents concentration criteria for the protection of fresh water and salt water aquatic life. It presents safe concentrations for humans, and in the case of suspect or proven carcinogens, gives various levels of incremental cancer risk. A section 304(a) water quality criterion is a qualitative or quantitative estimate of the concentration of a water constituent or pollutant in ambient waters which, when not exceeded, will ensure a water quality sufficient to protect a specified water use. Under the Act a criterion is a scientific entity, based solely on data and scientific judgement. It does not reflect considerations of economic or technological feasibility nor is it a water quality standard and in itself has no regulatory effect. (Author abstract by permission)

See also 81-0603, 81-0604, 81-0605, 81-0607, 81-0618, 81-0620, 81-0621, 81-0622, 81-0624, 81-0625, 81-0626, 81-0627, 81-0630, 81-0631, 81-0634, 81-0638, 81-0639, 81-0651, 81-0653, 81-0659, 81-0664, 81-0666, 81-0667, 81-0668, 81-0669, 81-0677, 80-0683, 81-0684, 81-0687, 81-0688, 81-0691, 81-0741, 81-0778, 81-0809, 81-0810, 81-0811, 81-0812, 81-0813, 81-0814, 81-0815, 81-0816, 81-0817, 81-0818, 81-0819, 81-0820, 81-0821, 81-0822, 81-0823, 81-0824, 81-0825, 81-0826, 81-0827, 81-0828, 81-0829, 81-0830, 81-0831, 81-0832, 81-0833, 81-0836, 81-0876, 81-0886, 81-0895 *and* 81-0896.

81-0740. Menzel, D. B. (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **From animals to man, the grand extrapolation of environmental toxicology.** *ACS Symp. Ser.* 174(CH01): 1-14; 1979 (9 references).

Aspects of extrapolating toxicity tests on animals to humans are discussed. Mutagenesis, carcinogenesis and metabolism are some of the major areas of investigation. Mutagens are screened by several methods, particularly the Ames test bacterial assay. Results of the Ames test for ethylene dibromide and 1,2-dibromo-3-chloropropane are presented in graphic form. The possibility that carcinogenesis is caused by mutagenesis is discussed. All carcinogens tested have been shown to be mutagenic to microorganisms. Metabolic studies have shown the activation of reactive intermediates, which combine with cell constitutents to cause a general toxic reaction. Hormonal pathways of air pollutant toxicity are discussed. Interaction of organophosphate and carbamate insecticides with hormonal receptors is considered. Mathematical models, based on chemical reactions, rate equations, mass transport and anatomical information, have been developed for the measurement of tissue dose for many toxicants.

81-0741. Stara, J. F.; Kello, D. (Environ. Criteria & Assess. Off., US EPA, Cincinnati, OH 45268) **Relationship of long-term animal studies to human disease.** *ACS Symp. Ser.* 174(CH04): 43-76; 1979 (74 references).

Chemical testing is discussed, with emphasis on requirements for mammalian chronic toxicological studies and the importance of studies of chronic human diseases in higher mammalian species. Issues to be resolved for the accurate evaluation of human risk include the establishment of priorities for chemical testing, the cost of thorough testing, the determination of test dose, and the extrapolation of experimental animal data to man. The controversy over whether or not chemical carcinogens exhibit thresholds is also presented. A list of prioritized organic compounds considered to be hazardous to the environment and human health is presented in tabular form; hexachlorobenzene, hexachlorobutadiene, 1,3-dichloropropane, ethylene dibromide and PCBs are included. Many aspects of toxicity testing are considered. Determination of magnitude of usage of the agent, guidelines for priority selection, and *in vitro* and *in vivo* tests are discussed. The need for long-term studies is emphasized, and some factors involved in the design of such studies (species, lifespan, age, dose) are considered.

81-0742. Charles, J. M.; Menzel, D. B. (Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **Influence of atmospheric particulates on pulmonary absorption phenomenon.** *ACS Symp. Ser.* 174(CH15): 287-301; 1979 (33 references).

The influence of atmospheric particulates on pulmonary absorption is discussed. The application of pesticides is generally by liquid spray, which produces respirable aerosols. Isolated, ventilated and perfused rat lungs were used to test sulfate salts and the herbicides paraquat and diquat. ^{14}C-diquat removal from the air was initially rapid, and slowed with time. The results indicate 2 phases of removal from air. Paraquat accumulated in the lungs, and eventually began to appear in the perfusate. It is suggested that paraquat is absorbed by a 2-phase mechanism. The studies described here are attempts to characterize the removal process by examining kinetics parameters and developing models to describe the systems.

81-0743. Jagnow, G. (Inst. Bodenbiol., Bundesforchungsanst. Kandwirtsch., Branunschweig, BRD) **Effects of pesticides on nitrogen fixation (C_2H_2 reduction) by *Azotobacter chroococcum* and *Azospirillum lipoferum*.** *Acta Microbiol. Acad. Sci. Hung.* 27(3): 254; 1980.

Aerobic soil bacteria were exposed to various pesticides to determine their effects on nitrogen fixation. The bacteria were grown in semi-solid media with 0.2% agar. Supplies of oxygen were limited by diffusion. An N-free salt glucose medium was used to grow *Azotobacter chroococcum* while *Azospirillum lipoferum* was grown in Dobereiner's malate medium at 30°C for 1 wk. Dinoseb and ioxynil were added at 20 and 100 μg/ml concentrations and paraquat and dodine at concentrations of 20 μg/ml. No inhibition or stimulation was noted when *A. lipoferum* was exposed to dinoseb or ioxynil. Strong initial inhibition reversed to strong stimulation when *A. chroococcum* was exposed to ioxynil and dodine, and also when *A. lipoferum* was exposed to dodine. Treatment of *A. chroococcum* with paraquat caused strong inhibition. [Presented at the 1979 Congress of the Hungarian Society of Microbiology.]

81-0744. Matsumoto, T.; Matsumori, H.; Kuwabara, N.; Fukuda, Y.; Ariwa, R. (Dep. Pathol., Sch. Med., Juntendo Univ., Tokyo 113, Japan) **A histopathological study of the liver in paraquat poisoning. An analysis of fourteen autopsy cases with emphasis on bile duct injury.** *Acta Pathol. Jpn.* 30(6): 859-870; 1980 (13 references).

A study of the effects of paraquat poisoning on the human liver is presented. Gross and histopathological examinations were performed on livers of 14 persons who died of paraquat poisoning. All but one of 8 persons who died within 4 days of ingestion, had sustained damage to the liver, and 3 of these had bile duct damage. Liver damage included acidophilic degeneration and fatty metamorphosis. The damage was similar to that caused by carbon tetrachloride poisoning. Bile duct injury consisted of epithelial changes of bile ductules and the ducts themselves. All cases demonstrated some damage, generally epithelial damage of lesser extent. Cholestasis was observed in some victims and portal inflammation and fibrosis were observed in a few of the cases. It appeared that the latter resulted from other causes.

81-0745. Funahashi, N.; Iwasaki, I.; Ide, G. (Dep. Physiopathol., Fac. Fish., Mie Univ., Tsu, Mie 514, Japan) **Effect of bis (tri-n-butyltin) oxide on endocrine and lymphoid organs of male rats.** *Acta Pathol. Jpn.* 30(6): 955-966; 1980 (62 references).

Studies were performed to determine the effects of bis (tri-n-butyltin) oxide (TBTO) on endocrine and lymphoid organs in rats. Five wk-old rats were dosed with varying concentrations of the compound by stomach tube. One group of rats was adrenalectomized and another group hypophysectomized at days 1, 2, 4 and 8 of the experiment. Rats used in acute tests received one dose (100 mg/kg), while rats used in chronic tests were dosed with 3, 6 or 12 mg/kg once daily for 5 days/wk for 13 or 26 wk. The LD50 value of TBTO was found to be 197 mg/kg. A single 100 mg dose caused adrenal hypertrophy, flattening of the thyroid epithelium, and atrophy of thymus and lymph nodes. The same response was observed for total doses of 390-780 mg/kg in 13 wk or 780-1560 mg/kg in 26 wk. Other histological and immunohistochemical alterations as a result of treatment with TBTO were also observed.

81-0746. Andujar, M.; Navarro, P.; Varela, G. (Inst. Nutr. Fac. Pharm., Univ. Madrid, Madrid, Spain) **Repercussions de l'ingestion prolongee de dieldrine sur la digestibilite des nutriments et le bilan azote chez la caille. [Repercussion of extended ingestion of dieldrin on the digestibility of nutrients and the nitrogen balance in quail.]** *Ann. Nutr. Aliment.* 34(3): 537-545; 1980 (28 references) (French).

The effect of dieldrin addition to feed on the utilization of nutrients (fat, fiber, protein, non-nitrogenous organic compounds) and extract metabolism by quail was studied over a 48 day period. At the level fed (20 ppm) dieldrin had no significant effect on wt gain of females, but it did affect male wt gain significantly ($p < 0.05$). Judged by the digestibility coefficient and nitrogen balance protein utilization was unaffected as was the utilization of carbohydrates (nitrogen-free extract) and raw fiber; in males wt gain decrease due to reduced fat assimilation occurred after 48 days of administration of dieldrin, but not earlier. This is attributed to the potential effect of dieldrin on enzymatic activity involved in fat metabolism.

81-0747. Davies, D. B.; Holub, B. J. (Dep. Nutr., Coll. Biol. Sci., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Toxicological evaluation of dietary diazinon in the rat.** *Arch. Environ. Contam. Toxicol.* 9(6): 637-650; 1980 (33 references).

Female Wistar rats were fed a semi-purified diet containing either no pesticide or 0.1-15 ppm diazinon for up to 92 days. At specified times, animals were bled from the orbital sinus to facilitate measurement of plasma and erythrocyte cholinesterase activity using a highly sensitive radiometric assay. Additional rats were sacrificed to determine brain acetylcholinesterase activity. General nutritional parameters measured included body wt gains and feed consumption during the growing period. Feeding diazinon at the levels employed produced no visible toxic manifestations. Treated animals showed weight gains and feed consumption which were comparable to appropriate controls. Feeding trials up to 90 days revealed that rats were highly sensitive to diazinon after 31-35 days exposure, as judged by reduction of plasma and erythrocyte cholinesterase activities. Brain acetylcholinesterase was judged to be insensitive to dietary diazinon (1.0-15 ppm), although moderate reduction (by 6%) of brain enzyme activity was noted among animals fed 10 ppm diazinon at day 92. For all feeding trials, plasma cholinesterase was a more sensitive indicator of diazinon toxicity compared to erythrocyte or brain acetylcholinesterase. The no effect level of diazinon for the rat was judged to be 0.1 ppm in the diet, which translates into an equivalent daily intake of 9 μg/kg body wt/day. This no effect level is 20- to 50-fold lower than levels reported elsewhere in the literature, which may be attributed, in part, to the use of female animals in the present studies. (Author abstract by permission)

81-0748. McLane, M. A. R.; Hughes, D. L. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Reproductive success of screech owls fed Aroclor 1248.** *Arch. Environ. Contam. Toxicol.* 9(6): 661-665; 1980 (16 references).

Nine breeding pairs of screech owls were exposed to 3.0 ppm Aroclor 1248, dissolved in propylene glycol and mixed with their food. Aroclor 1248 had no detectable effect on reproduction. Levels of DDE found in the experimental animals ranged from 0.37 to 0.46 ppm. Dieldrin was found at 0.03-0.05 ppm for the experimental animals. No significant differences were found between residues of DDE and dieldrin in fledglings of control or dosed parents.

81-0749. Ehling, U. H. (Inst. Genet., Ges. Strahlen & Umweltforschung, D-8042 Neuherberg, BRD) **Induction of gene mutations in germ cells of the mouse.** *Arch. Toxicol.* 46(1-2): 123-138; 1980 (32 references).

Methods available to study the induction of gene mutations in mammalian germ cells are described. Results of specific locus experiments with mice indicate the importance of this test for the validation of short term tests. Out of 5 compounds [methyl methanesulfonate (MMS), mitomycin C, N-nitrosodiethylamine (DEN), procarbazine and atrazine] studied extensively in the Environmental Research Program of the Commission of the European Communities, 2 (MMS and mitomycin C) induced mutations in the *Salmonella typhimurium* test and in the specific locus test, while 2 others (procarbazine and atrazine) induced mutations only in mammals. In contrast to radiation, chemical mutagens can express mutations in certain gametogenic stages only. The different gametogenic

sensitivity of mammalian germ cells to chemical mutagens gives a clue for the evaluation of mutagenicity data. In the linear part of the dose-effect-curve fractionation of a dose of 600 mg/kg procarbazine reduced the yield of specific locus mutations. In the descending part of the dose-effect-curve fractionation of a dose increased the rate of specific locus mutations above the single total dose. Experiments with procarbazine indicate that oocytes are less sensitive than spermatogonia for the induction of specific locus mutations. The genetic risk is defined as the increase in percent of the spontaneous mutation rate. The genetic risk can be calculated with high confidence on the basis of relatively few animals in the experimental group. The ratio between the therapeutic dose and the doubling dose gives the percentage increase of the spontaneous mutation frequency of a patient (individual risk). The ratio between the population dose and the doubling dose gives the percentage increase of the spontaneous mutation frequency of a population (population risk). The quantification of the genetic risk of the first generation is possible on the basis of dominant cataract mutations in mice. All extrapolations are based on the assumption that man and mice are equally sensitive to the induction of gene mutations. (Author abstract by permission)

81-0750. Herzberg, A.; Gelman, A.; Perry, A. S. (Fish. Technol. Unit, Dep. Fish., Min. Agric., Haifa 31000, Israel) **The location of lindane (γ-hexachlorocyclohexane) in fish after deliberate poisoning.** *Bamidgeh (Bull. Fish Cult. Israel)* 32(1): 16-19; 1980 (3 references).

The use of pesticide concentrations in the gills as an indicator of intentional acute poisoning of fish was studied. Six groups of 3-5 *Sarotherodon galilaeus* were exposed to lindane at 0.01, 0.04, 0.08, 0.12, 0.5 or 1.0 ppm. When the fish became stunned they were dissected; brain, heart and gills were analyzed for pesticide residues. Three other groups were exposed to 0.8, 1.0 and 1.2 ppm and upon becoming stunned they were placed in fresh water. After recuperation, brain, heart and gills were analyzed for residues. Highest levels were found in the brain (2.22 ppm from 0.5 ppm exposure) and lowest in the gills (0.33-0.5 ppm). When the fish were allowed to recuperate, the gill levels dropped to 0.26-0.40 ppm. It was suggested that levels ⩾ 0.25 ppm lindane in the gills should be regarded as evidence that the fish were caught after poisoning.

81-0751. van Bladeren, P. J.; Breimer, D. D.; Rotteveel-Smijs, G. M. T.; de Jong, R. A. W.; Buijs, W.; van der Gen, A.; Mohn, G. R. (Dep. Pharmacol., Univ. Leiden, NL-2300 RA Leiden, The Netherlands) **The role of glutathione conjugation in the mutagenicity of 1,2-dibromoethane.** *Biochem. Pharmacol.* 29(21): 2975-2982; 1980 (24 references).

Two mechanisms for the toxic actions of 1,2-dibromoethane (ethylene dibromide) have been postulated, both of which involve biotransformation. The first is oxidation to 2-bromoacetaldehyde, a highly reactive substance, the second a possible direct conjugation to glutathione, giving rise to a reactive half-mustard. It was the purpose of this investigation to determine to what extent these 2 reactive species are responsible for the mutagenicity of 1,2-dibromoethane. To assess quantitatively the importance of the conjugation to glutathione *in vivo*, rats were administered single doses of 1,2-dibromoethane; 30-55% of the dose was excreted as mercapturic acid. The conjugation of 1,2-dibromoethane to glutathione was also studied *in vitro*. Specific activities of the metabolizing systems used in the mutagenicity experiments were determined. The mutagenicity of 1,2-dibromoethane towards *Salmonella typhimurium* TA100 was considerably enhanced by the addition of 100,000 *g* supernatant fraction, whereas the addition of microsomes had no effect, indicating that the primary glutathione adduct is responsible for the mutagenic effect. As a model for the mutagenic intermediate, *S*-2-bromoethyl-*N*-acetyl-cysteine methyl ester was synthesized. This proved to be a very reactive and highly mutagenic compound, which can be further metabolized and thereby detoxified by glutathione conjugation. A similar phenomenon is likely to occur in the mutagenicity test with 1,2-dibromoethane, where after an initial rise in the number of mutants with increasing amounts of glutathione, the number of mutations decreases again. These results clearly indicate that glutathione conjugation plays an important role in the mutagenicity of 1,2-dibromoethane. (Author abstract by permission)

81-0752. Mehra, M.; Kanwar, K. C. (Dep. Biophys., Panjab Univ., Chandigarh 160014, India) **Absorption, distribution, and excretion of methylmercury in mice.** *Bull. Environ. Contam. Toxicol.* 24(4): 627-634; 1980 (22 references).

Male Swiss albino mice were fed methylmercury at 20 μCi/100 g body wt. A second group of animals was exposed to similar concentrations ip. Results indicated that uptake and distribution of the contaminant depended upon the route of administration. However, relative uptake in various tissues was similar. Whole blood and erythrocytes showed fast incorporation of methylmercury after ip injection; peak levels in the erythrocytes were reached 2 hr post-administration. Peak levels following po administration were not reached until after 12 hr. The chemical was present largely in the kidneys and liver; the kidneys contained up to 5 times the amounts found in the liver. Spleen, heart, and lung took the chemical up more quickly, but did not accumulate it to the same extent as the liver and kidney. Methylmercury was incorporated only slowly into the cerebrum, the cerebellum and the pons. Differential uptake by the different regions of the brain was noted. The reproductive tissues demonstrated poor uptake; peak levels of only 1% of the administered dose were registered in some cases. The amount of methylmercury excreted in the

feces was highest on day 1, and steadily decreased during the next 2 days.

81-0753. Gill, S. S. (Div. Toxicol. Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) ***In Vitro* metabolism of carbofuran by liver microsomes of the padifield fish *Trichogaster pectoralis*.** *Bull. Environ. Contam. Toxicol.* 25(5): 697-701; 1980 (11 references).

The extent of metabolism of carbofuran in the fish *Trichogaster pectoralis* was studied. This padifield fish, caught in areas sprayed with carbofuran, is an important protein source for the rural people of West Malaysia. Fish collected from the padifields were maintained in aerated well water for 1 mo prior to use. They were then decapitated, their livers removed, and the microsomal fraction obtained from liver homogenates. Mixtures consisting of microsomal preparations, NADPH, $MgCl_2$, carbofuran (0.1 μmol in 20 μl ethanol) and radioactivity (840 Bq/flask) were incubated for one hr. The mixture was extracted with ether 3 times and the ether fractions combined. In order to identify metabolic products containing an intact *N*-methylcarbamate moiety, the ether products were treated with NaOH, acidified, extracted with ether and ether phase dried, then the residue was dissolved in methanol and separation by silica gel chromatography. Liquid scintillation counting was used to quantify the radioactive spots detected by autoradiography. The metabolites were identified by cochromatography with authentic standards. Two major metabolic products (N-CH_2-OH-CF and 3-OH-CF) and 2 minor ones (3-keto-CF and 3-keto-phenol) were identified. Their formation was dependent on the presence of NADPH and the microsomal fraction. The results show oxidative hydroxylation to be the major route of metabolism.

81-0754. Kurihara, N.5; Nakajima, M. (Radioisot. Res. Cent., Kyoto Univ., Kyoto, Japan) **Biodegradation of lindane (γ-HCH) and its isomers by mammals and insects.** *Bull. Inst. Chem. Res. Kyoto Univ.* 58(3): 390-417; 1980 (68 references).

The metabolism of lindane and its isomers by mammals and insects is reviewed. The major metabolic pathways are dehydrogenation reactions, dehydrochlorination and oxygenation. Ene-like reaction, oxygen insertion into C-H bonds, and nucleophilic oxygen attack are three mechanisms that appear to occur in oxygenation reactions. The glutathione conjugation reaction involves nucleophilic attack of a glutathione molecule towards allylic substrate carbons. Metabolic reduction reactions lead to dechlorination. Most of the metabolism of lindane has been determined; however, several aspects remain unexplained, including the synthetic pathways of the metabolites tetrachlorocyclohexanol and tetrachlorophenylmercapturic acid.

81-0755. Ghiasuddin, S. M.; Kadous, A. A.; Matsumura, F. (Pestic. Res. Cent., Michigan State Univ., East Lansing, MI 48824) **Reduced sensitivity of a Ca-ATPase in the DDT-resistant strains of the German cockroach.** *Comp. Biochem. Physiol. C* 68(1): 15-20; 1980 (25 references).

DDT-resistant cockroaches were found to have a relatively DDT-insensitive Ca-ATPase as compared to the susceptible one. This Ca-ATPase present in the 90,000 *g* membrane fraction from the brains of German cockroaches showed identical enzyme characteristics as the *ecto* Ca-ATPase of the lobster nerve which has been previously shown to be highly sensitive to DDT. The resistant strain also shows decreased sensitivities *in vivo* toward inhibitors of this ATPase. (Author abstract by permission)

81-0756. de la Manche, I.; Desroches, A. M.; Bouchaud, G.; Laget, P. (Lab. Cytol., Univ. Pierre-et-Marie-Curie, Paris VI, F-75005 Paris, France) **Electrocorticogrammes et effets histochimiques accompagnant chez le rat la reactivation des cholinesterases apres action d'un inhibiteur organophosphore. [Electrocorticograms and histochemical changes accompanying the reactivation of cholinesterase activity following action of an organophosphorus inhibitor in rats.]** *C. R. Acad. Sci. Ser. D* (4): 401-403; 1980 (5 references) (French).

The electrocorticographic changes induced in rats by intracarotid injection of paraoxon were monitored. Enzymatic cholinesterase activity was measured by the histochemical method of Koelle and Friedenwald on transverse brain sections of the cortex, striated bodies, supraoptic nucleus and septum. Paraoxon, an organophosphorus inhibitor of cholinesterases, elicits theta rhythms, fast rhythms and paraoxysmal changes. Theta rhythms can be suppressed by atropine. Administration of aromatic oximes (toxogonine) will suppress fast rhythms and paraoxysmal changes. The effect of atropine on theta rhythm is thought to be due to the control of the waking state by the cholinergic system. The effect of oximes is unexplained; one hypothesis postulates that normal bioelectric activity is closely dependent on an equilibrium between the cholinergic and the monoaminergic systems.

81-0757. Mishra, R. K.; Jha, L. K. (Dep. Zool., Mithila Univ., Bihar, India) **Effect of tepa on the free amino acids of ovary in *Dysdercus cingulatus* fabr.** *Curr. Sci.* 49(17): 661-663; 1980 (12 references).

The amino acid content of the ovary in *Dysdercus cingulatus* was investigated both under normal conditions and when treated with tepa, a chemosterilant. The ethanol extracts of normal ovary indicate the presence of 18 ninhydrin positive spots, 15 of which are known and 3 are unknown amino acids. After exposure to tepa, the color intensities of 10 of the amino

acids decreased while that of 7 of the amino acids increased in comparison to normal insects. Two amino acids were not affected. The chemosterilant blocked utilization of lysine and arginine in the formation of yolk and other protein which may lead to degeneration of the oocyte and inhibition of ovarian growth.

81-0758. Watanabe, P. G.; Reitz, R. H.; Schumann, A. M.; McKenna, M. J.; Quast, J. F.; Gehring, P. J. (Toxicol. Res. Lab., Health & Environ. Sci., Dow Chem. USA, Midland, MI 48640) **Implications of the mechanisms of tumorigenicity for risk assessment.** *Dev. Toxicol. Environ. Sci.* 6: 69-89; 1980 (27 references).

To accurately estimate the degree of risk involved on exposure to any particular hazardous chemical, results of various acute and chronic toxicity tests must be evaluated and combined with results from pharmacokinetic and chemical-macromolecular interaction studies. The importance of pharmacokinetics and resultant macromolecular interactions in explaining, mechanistically, why mice appear more sensitive than rats to the tumorigenic effects of chlorinated hydrocarbons was investigated using vinylidene chloride (1,1-dichloroethylene; VCD) and perchloroethylene (Perc) as test substances. In all tests performed, the most striking finding was the low degree of DNA alkylation in target tissues detected after exposure to either of these chemicals as compared to that observed after exposure to dimethylnitrosamine. Both VCD and Perc demonstrated significant cytotoxic activity by increasing DNA synthesis in the organs which developed tumors. The studies demonstrated that VDC and Perc are activated in the body to reactive intermediate metabolites that are toxic and carcinogenic. The mouse metabolizes and produces more reactive metabolites than the rat. This enhances binding to intracellular macromolecules in susceptible organs in the mouse. It is suggested that chemicals such as DDT, chloroform, carbon tetrachloride and saccharin are likely to be epigenetic carcinogens as well.

81-0759. Van Stee, E. W. (Natl. Inst. Environ. Health Sci., Research Triangle Park, NC 27709) **Myocardial toxicity.** *Dev. Toxicol. Environ. Sci.* 6: 167-182; 1980 (79 references).

Cardiotoxic drugs and chemicals are discussed. Consideration is given to chlordimeform, an insecticide of low mammalian toxicity. The mode of action in target species is not through cholinesterase inhibition. Lethal doses administered to rats cause hyperexcitement followed by death in a few hr. Hypotension preceding death suggests that cardiovascular toxicity may be significant. Chlordimeform is able to inhibit monoamine oxidase, (MAO). MAO inhibitors apparently act by elevating local concentrations of α-adrenergic neurotransmitter at the brainstem, inhibiting central sympathetic outflow. Pretreatment of rats with *p*-chlorophenylalanine or α-methyl-*p*-tyrosine were without effect. Chlordimeform in the dog, rabbit and cat caused cardiovascular dynamic depression with CNS stimulation. Various lipid soluble organic compounds have been demonstrated to be mediators of the cardiovascular depressant agents. Methods of assessing cardiotoxicity are briefly discussed.

81-0760. Neal, R. A. (Cent. Environ. Toxicol., Dep. Biochem., Sch. Med., Vanderbilt Univ., Nashville, TN 37232) **Metabolism and mechanisms of toxicity of compounds containing thiono-sulfur.** *Dev. Toxicol. Environ. Sci.* 6: 241-250; 1980 (14 references).

The structure of metabolites of various thiono-sulfur compounds formed in reactions catalyzed by cytochrome P-450 monooxygenase systems was examined. The goal of the studies was identification of the metabolites responsible for inhibition of the monooxygenases when these thiono-sulfur compounds were administered *in vivo* or incubated with the hepatic microsomes *in vitro*. One compound studied was parathion. The initial reaction involves a transfer of singlet oxygen atom from the cytochrome P-450 molecule to one of the unshared electron pairs on the thiono-sulfur group of parathion, producing a S-oxide that can assume 4 resonance forms, one of which cyclices to a tricyclic phosphorus-sulfur- oxygen intermediate, a phosphooxathiiran, which undergoes electron rearrangement leading to paraoxon. Similarly detailed information is offered concerning thioacetamide. It is concluded that the toxic effects of thiono-sulfur compounds appear at least partly due to their metabolism to reactive intermediates by the cytochrome P-450 containing monooxygenase enzyme systems. Covalent binding to atomic sulfur released in the cytochrome P-450 monooxygenase catalyzed metabolism is responsible for inhibition of monooxygenase activity and loss of cytochrome P-450 noted when thiono-sulfur compounds are administered *in vivo* or *in vitro*. It is suggested that liver necrosis and the induction of lung edema and neoplasia may result from covalent binding of the electrophilic S-oxides or S-dioxides or carbene derivatives of these S-oxides and S-dioxides to tissue macromolecules.

81-0761. Van Ryzin, J.; Rai, K. (Rand Corp., Santa Monica, CA) **The use of quantal response data to make predictions.** *Dev. Toxicol. Environ. Sci.* 6: 273-290; 1980 (28 references).

The use of quantal response toxicity data from animal studies to predict toxic responses in man is considered. Quantal response data is defined as response rates for a specified toxic endpoint in an animal toxicity test. A brief review of dose-response models is presented, followed by the statistical methodology of low-dose prediction or extrapolation. The methodology is then applied to three sets of data in order to illustrate certain important points in

prediction. The question of linearity versus non-linearity at low doses is discussed in relation to ethylenethiourea. Three proposed stochastic biological models are considered; the one-hit model, the multi-hit model and the multi-stage model. A modification of the multi-hit model is explained for accommodation of possible low-dose linearity. The use of dose-response models for noncarcinogenic low-dose prediction is considered as opposed to the commonly used toxicological procedure of using a no observed effect level.

81-0762. Aldridge, W. N. (Med. Res. Counc., Toxicol. Unit, Carshalton, Surrey, England) **The need to understand mechanisms.** *Dev. Toxicol. Environ. Sci.* 6: 305-319; 1980 (67 references).

The study of the mechanism of action of toxic substances provides information useful in the evaluation of possible hazards to man and in the design of safe, effective chemicals (such as insecticides). Understanding of mechanisms of action involves study of carcinogenesis, mutagenesis, teratogenesis, central nervous system effects, immunological responses and molecular interactions. Work on the toxic mechanisms of antiesterase compounds, including esters of organophosphorus, carbamic, and organosulfur acids (organophosphate and carbamate insecticides) is reviewed. Target site, delivery of toxin to site of action, mechanism of toxicity, metabolic transformation, acetylcholinesterase inhibition, the prediction of dose responses, and the prevention and treatment of poisoning are discussed.

81-0763. Fayolle, L. (Lab. Zooecol. Sol, INRA, F-21034 Dijon, France) **Consequences de l'Apport de Contaminants sur les Lombriciens. III. Essais de Laboratoire. [Consequences of the impact of pollutants on earthworms. III. Laboratory tests.]** *Doc. Pedozool.* 1(1): 34-65; 1979 (44 references) (French).

Effects of various contaminants on earthworms (*Allolobophora chlorotica*) were studied during 7 days of exposure to contaminated soil. Contaminants included in the study were DNOC, methabenzthiazuron, pyrazone (chloridazon), nitrofen, simazine, aldicarb, parathion, methiocarb, dimethoate, lindane, benomyl, maneb, mercury and copper. The study permitted the acute toxicities of several of these contaminants to be calculated, including DNOC, aldicarb and benomyl. For benomyl acute toxicity was observed only after a period of time, probably due to the formation of various biodegradable residues. In feeding tests using contaminated litter, *Lumbricus terrestris* demonstrated behavior which indicated a decreased palatability of the feed. Susceptibilities of the species varied with the degree of exposure to the contaminants.

81-0764. Wolff, T.; Greim, H.; Huang, M. T.; Miwa, G. T.; Lu, A. Y. H. (Abt. Toxikol., Ges. Strahlen & Umweltforschung, Neuherberg, BRD) **Aldrin epoxidation catalyzed by purified rat-liver cytochromes P-450 and P-448.** *Eur. J. Biochem.* 111(2): 545-551; 1980 (26 references).

Monooxygenase systems reconstituted from purified rat liver microsomal cytochrome P-450 or P-448, NADPH-cytochrome c reductase, dilaurophosphatidylcholine ($Lau_2PtdCho$), and sodium cholate were used in studies on aldrin epoxidation. Aldrin was added to the incubation mixture containing enzymes and lipid components, and the reaction was terminated after 5 min by vigorous shaking with n-hexane. The mixture was centrifuged to facilitate phase separation, then diluted to obtain an appropriate dieldrin concentration for gas chromatography analysis. Cytochrome P-450 showed a high rate of dieldrin formation. Low enzyme activity occurred in the absence of lipid and sodium cholate, but this could be increased 3-fold by addition of the lipid component $Lau_2PtdCho$, and further stimulated 2-fold by the addition of sodium cholate. The apparent K_m for aldrin in the complete system was $7.2 \pm 2\ \mu M$. In tests using inhibitors, SKF 525-A inhibited aldrin epoxidation, but 7,8-benzoflavone did not. In contrast to the results on cytochrome P-450, cytochrome P-448 showed a very low rate of epoxidation. Enzyme activity was dependent on $Lau_2PtdCho$, and both SKF 525-A and 7,8-benzoflavone inhibited activity. The apparent K_m for aldrin was $27 \pm 7\ \mu M$. The results indicate that aldrin epoxidation is primarily a cytochrome P-450 dependent reaction. The possible reasons for the low capability of cytochrome P-448 to metabolize aldrin are discussed.

81-0765. Pritchard, J. B.; Miller, D. S. (Lab. Pharmacol., NIEHS, Res. Triangle Park, NC 27709) **Teleost kidney in evaluation of xenobiotic toxicity and elimination.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(14): 3207-3212; 1980 (22 references).

The unique anatomy of the marine teleost kidney and the development of techniques to take advantage of that anatomy are discussed and several examples of their use to study xenobiotic excretion and toxicity are documented. These include characterization of renal organic anion transport, the system that mediates excretion of many such compounds and their metabolites; assessment of the relative roles of transport, metabolism, and plasma binding in xenobiotic (2,4-D and DDT) excretion; examination of the morphological aspects of cellular injury; and analysis of subcellular sites of heavy metal toxicity. Results of a study of the renal clearance of 2,4-D and the DDT metabolite DNA by the winter flounder are presented. Also presented are applications of new techniques in membrane physiology to the study of the effects of xenobiotics. It is suggested that continued application of the comparative approach, as exemplified by the use of the marine teleost kidney, will provide powerful and versatile

tools for investigation of fundamental biological processes and the interactions of foreign compounds with those processes. (Author abstract by permission, modified)

81-0766. Curtin, T.; Mulhern, B. (Child. Res. Cent., Our Lady's Hosp. Sick Child., Dublin, Ireland) **Fetal warfarin syndrome.** *Irish Med. J.* 73(10): 393-394; 1980 (21 references).

A case of teratogenicity of warfarin is reported. A boy infant was born with marked nasal hypoplasia; he had a great deal of difficulty in nursing. After 4 days of intubation in the hospital he was released. Stipled epiphyses were demonstrated on x-ray in both femoral heads, sacrococygeal region and right calcaneum. No evidence of optic atrophy was reported. A CT brain scan at 6 wk appeared normal. At 3 mo the infant was developing normally. The mother had been taking warfarin at 3 and 4 mg on alternate days from wk 9 of gestation. Digoxin and warfarin were continued up to 9 days prior to delivery when the warfarin was replaced by heparin at 5000 units b.d. sc. It is urged that use of warfarin during pregnancy be disallowed and that warfarin patients be advised not to conceive during this time.

81-0767. Quinlan, R. A.; Pogson, C. I.; Gull, K.* (Biol. Lab., Univ. Kent, Canterbury, Kent CT2 7NJ, England) **The influence of the microtubule inhibitor, methyl benzimidazole-2-yl-carbamate (MBC) on nuclear division and the cell cycle in *Saccharomyces cerevisiae*.** *J. Cell Sci.* 46: 341-352; 1980 (32 references).

Studies were performed to investigate the influence of a carbamate fungicide on nuclear and cell division by interference with microtubule formation. *Saccharomyces cerevisiae* strain 20B-12 was treated with 100 μM methyl benzimidazol-2-yl- carbamate (MBC; carbendazim). Cell numbers were determined by a Coulter Counter, cells were examined by light and electron microscopy, and light scattering was determined by photoelectric colorimetry. MBC reduced the growth of the cells; observed as a build-up of cells as large as doublets. Toxic action appeared to occur between spindle pole body duplication and spindle pole body separation. Electron microscopy demonstrated the absence of cytoplasmic and spindle microtubules and altered spindle pole body structure. The nuclei of these enlarged cells were also increased in size; however, there were no signs of division, such as septa. It is suggested that inhibition occurs as a result of the prevention of microtubule formation.

81-0768. Okura, I.; Thuan, N. K. (Dep. Chem. Eng., Tokyo Inst. Technol., Meguro-ku, Tokyo 152, Japan) **Kinetics and mechanism of methyl viologen reduction and hydrogen generation by visible light with hematoporphyrin catalyzed by hydrogenase.** *J. Chem. Soc. Faraday Trans. 1* 76(11): 2209-2211; 1980 (5 references).

A detailed description is presented of the reaction of methyl viologen (paraquat) in a micellar solution containing hematoporphyrin (Hm) and a reducing agent, and irradiated by visible light. The cation of methyl viologen is formed and hydrogen is produced upon addition of hydrogenase to the system. Reduction rate was influenced by the nature of the surfactant. Cationic surfactants resulted in reduction activity; no activity was observed with anionic surfactant. MV^+ concentration increased rapidly on irradiation with visible light, then reached a constant value. Initial reaction rate was proportional to Hm concentration. A Langmuir adsorption type dependence of the reaction rate on concentration of methyl viologen and the reducing agent tris(2-hydroxylethyl) amine (TEA) was observed. Hydrogen evolution as a result of water reduction was observed after irradiation at 500 nm of a mixture of Hm (photosensitiser), methyl viologen (electron carrier), reducing agent and hydrogenase (catalyst). Hydrogen evolution was observed with any of the reducing agents used (TEA, 2-mercaptoethanol, glutathione, NADH and NADPH) and/or when hydrogenase was replaced with colloidal platinum.

81-0769. Harvey, M. J.; Sharma, R. P.* (Toxicol. Prog., UMC 56, Utah State Univ., Logan, UT 84322) **Organophosphate cytotoxicity: the effects of protein metabolism in cultured neuroblastoma cells.** *J. Environ. Pathol. Toxicol.* 3(5-6): 423-436; 1980 (24 references).

Studies using homogenous neuronal cell systems were carried out to determine if organophosphorus compounds affect the ability of nerve cells to synthesize proteins, and to explore possible differences between neurotoxic and non-neurotoxic organophosphorus compounds. Neuroblastoma 2-A cells were cultured with various concentrations of tri-o-tolyl-phosphate (TOTP), diisopropylfluorophosphate (DFP), and dicrotophos. ^{14}C-Incorporation from glucose was used as an indicator of metabolic activity, and L-leucine-^{14}C incorporation as an indicator of proteosynthetic activity. Cells were also observed by phase-contrast microscopy. Results showed that the cytotoxicity of TOTP was two orders of magnitude greater than that of DFP or dicrotophos, and dicrotophos was slightly less cytotoxic than DFP. All compounds caused neurites to have a shrunken, rough and irregular appearance, with swellings along the length of the neurites. All compounds caused reductions in ^{14}C-incorporation from glucose; probably an indicator of cytotoxicity. Incorporation of leucine-^{14}C was inhibited by DFP and TOTP, but not by dicrotophos. It is suggested that the rate of protein synthesis is depressed by neurotoxic organophosphate compounds, which may by responsible for the degenerative syndrome.

81-0770. Koschier, F. J.; Stokols, M. F.; Cattrall, P. J.; Conway, W. D.; Acara, M.; Hong, S. K. (Dep. Physiol.,

Sch. Med., State Univ. New York, Buffalo, NY 14214) **Renal tubular transport and nephrotoxicity of DDA.** *J. Environ. Pathol. Toxicol.* 3(5-6): 513-527; 1980 (23 references).

Nephrotoxic effects of DDA [*bis(p*-chlorophenyl acetic acid], the principal water-soluble metabolite of DDT, were studied using isolated, perfused rat kidney. When DDA, at 0.6 μM, was present in a dextrose perfusate which eliminated DDA-colloid binding, the DDA to inulin clearance ratio was 0.05; indicative of tubular reabsorption. DDA did not affect the glomerular filtration rate or the fractional reabsorption of Na^+, K^+ or H_2O. Renal cortical slices were used in studies to determine the concentration of DDA which would effect renal cellular function. Only high concentrations of DDA ($\geq$ 0.1 mM) produced significant alterations in tetraethylammonium transport, tissue oxygen consumption, and intracellular electrolyte composition. No effects were observed on Na^+,K^+-ATPase activity. DDA undergoes net tubular absorption and metabolism by the kidney. However, high levels are required to produce effects on renal function; low levels present in man and animals suggest no acute effect of DDA on renal function.

81-0771. Skalsky, H. L.; Wrenn, J. M.; Borzelleca, J. F. (Div. Toxicol., Dep. Pharmacol., Med. Coll. Virginia, Richmond, VA 23298) ***In vitro* and *in vivo* evaluation of movement of Kepone in the rat submaxillary gland.** *J. Environ. Pathol. Toxicol.* 3(5-6): 529-536; 1980 (23 references).

The transport of Kepone (chlordecone) in submaxillary glands was investigated *in vitro* and *in vivo*. Rat glands were isolated, cut into slices and incubated with 10^{-6} M, 10^{-5} M, 10^{-4} M and 10^{-3} M ^{14}C-Kepone for 60 min for the uptake and efflux studies. *In vivo* studies involved dosing anesthetized rats by gavage with Kepone, then removing the submaxillary glands and analyzing them for Kepone at various intervals after dosing. There appears to be a fast and slow component of uptake and efflux; the rate constants were 0.0037 for the slow and 0.843 for the fast component. After oral ingestion, Kepone concentrations in saliva reached a peak in 24 hr. Levels in salivary glands were lower than in liver and fat tissues, and levels in the saliva were always lower than in the serum. Monitoring biotransformations of Kepone failed due to low concentrations of the metabolites.

81-0772. Hodgson, E.; Kulkarni, A. P.; Fabacher, D. L.; Robacker, K. M. (Toxicol. Program, Dep. Entomol., North Carolina State Univ., Raleigh, NC 27650) **Induction of hepatic drug metabolizing enzymes in mammals by pesticides: a review.** *J. Environ. Sci. Health B* 15(6): 723-754; 1980 (129 references).

The induction of drug metabolizing enzymes in mammals, including enzymes of the cytochrome P-450-dependent microsomal mixed function oxidase (MFO) system and glutathione *S*-transferases (GT), are reviewed. The general characteristic of induction in mammals is outlined with particular emphasis on insecticidal inducers. Some basic data gained from previous studies on the induction of mammalian microsomal enzymes insecticides are given and background material on the induction by the organochlorine compounds (DDT, aldrin, dieldrin, chlordane, toxaphene, heptachlor, lindane and mirex), synergists, methylated benzenes and methylated naphthalenes is examined in detail. Current work at North Carolina State University to date has involved research on the induction of MFO and GT enzymes in mouse liver by 13 insecticides, 3 herbicides, 2 insecticide synergists, 1 cotton defoliant, 1 polycyclic hydrocarbon, and 2 drugs. The significance of the induction of xenobiotic metabolizing enzymes and the possible role of these substances in natural detoxification processes and carcinogenesis are discussed.

81-0773. Brooks, G. T. (Agric. Res. Unit. Invert. Chem. & Physiol., Univ. Sussex, Brighton BN1 9RQ, England) **Perspectives of the chemical fate and toxicity of pesticides.** *J. Environ. Sci. Health B* 15(6): 755-793; 1980 (58 references).

A review of the chemical and biochemical transformation of pesticides in plants and animals is presented. Due to the widespread use of agricultural pesticides, many investigations on the transformation mechanisms in animals and plants have been carried out. The first step to assure safe use of pesticides in the environment is strict quality control in their chemical formulations to prevent unwanted and hazardous contaminants. Several instances of intoxication from technical impurities in methoxychlor, 2,4,5-T, lindane and malathion are cited to illustrate the importance of quality control in the manufacturing of these chemicals. The abiotic transformation of pesticidal compounds, such as heptahlor, aldrin, parathion and molinate, occurs largely through photochemical pathways. In the biotic environment pesticides, particularly cyclodiene or chlorinated insecticides and phenoxyalkonoic acid herbicides, usually undergo biochemical reactions resulting in either deactivation (detoxication) or activation (toxication) of bioactive compounds. Some of the *in vivo* and *in vitro* systems used to investigate the metabolism of pesticides in the biotic environment are listed for vertebrates, insects and other invertebrates, plants, and microorganisms.

81-0774. Shellenberger, T. E. (NCTR, US FDA, Jefferson, AR 72079) **Organophosphate pesticide inhibition of cholinesterase in laboratory animals and man and effects of oxime reactivators.** *J. Environ. Sci. Health B* 15(6): 795-822; 1980 (12 references).

A series of *in vivo* experiments were conducted in

which rabbit whole blood cholinesterase responses were examined to determine the structure activity relationships of dialkylphosphate inhibitors and oxime enzyme reactivators. The mechanisms of enzyme inhibition were studied through mathematical modeling and analog computer simulation of inhibitor and reactivator responses. Other factors such as percutaneous absorption and dithioate conversion which affect organophosphate ester toxicity were examined and applications of the model to the clinical situation were discussed. IV infusion of diethylphosphate esters (DE), such as dichlorvos and Bidrin (dicrotophos), produced dose and time dependent inhibiton of whole blood cholinesterase with rapid spontaneous recovery after 60-90 min. Similar results have been reported for Phosdrin (mevinphos), Azodrin (monocrotophos), and Guthion (azinphos-methyl). IV injection of oxime reactivators, 2-AM, P-2-S and TMB-4, produced dose-related reactivation of enzymes which were inhibited by both dimethyl and diethyl phosphate esters. The most effective activator was TMB-4. Marked inhibition of cholinesterase occurred with percutaneous application of dichlorvos, Phosdrin, Azodrin and Bidrin as technical grade materials. Absorption of these compounds was generally enhanced by xylene and DMSO. Results indicate that conversion of a phosphorothioate to its activated oxon can be determined *in vivo*, but the experimental approach must be altered to maximize the enzymatic activation.

81-0775. Johnson, M. K. (Molec. Toxicol. Sect., Toxicol. Unit., MRC, Carshalton, Surrey SM5 4EF, England) **The mechanism of delayed neuropathy caused by some organophosphorus esters: using the understanding to improve safety.** *J. Environ. Sci. Health B* 15(6): 823-841; 1980 (34 references).

The delayed neurotoxicity mechanism of some organophosphorus esters, such as TOCP (tri-*o*-cresyl phosphate), EPN, trichlorfon, parathion mipafox, and DFP, is comprised of an initial two-step process involving a neurotoxic esterase (NTE) and aging. The inhibition of NTE in dosed hens may be quantitatively measured and used to assess the delayed neuropathic potential. Calculations of activity relationships have been made and the neurotoxic potentials of the organophosphorus esters which directly inhibit the esterases may be measured *in vitro*. Comparisons of human and hen NTE activities have been inconclusive; some compounds ellicit neuropathy to a greater extent in hens than in humans. For other compounds, the converse is true. It is suggested that, since the carbamates or phosphinate anticholinesterases are associated with the absence of delayed neurotoxic potential, these compounds would present the safest choice for use in new insecticide formulations.

81-0776. Waters, M. D.; Simmon, V. F.; Mitchell, A. D.; Jorgenson, T. A.; Valencia, R. (Health Eff. Res. Lab., Genet. Toxicol. Div., US EPA, Research Triangle Park, NC 27711) **An overview of short-term tests for the mutagenic and carcinogenic potential of pesticides.** *J. Environ. Sci. Health B* 15(6): 867-906; 1980 (75 references).

A review of short-term testing technology for evaluating the mutagenicity or carcinogenicity of pesticides is presented along with results of *in vitro* and *in vivo* mutagenicity and carcinogenicity tests of 38 pesticides. The phase 1 *in vitro* test data showed that only 6 of the 38 pesticides were positive in 3 or more of the 6 mutation assays. Acephate, monocrotophos, captan, demeton, folpet, and trichlorfon were positive as point mutagens and caused primary DNA damage in the form of enhanced mitotic recombination. The phase 2 *in vivo* assays involving *Drosophila* sex-linked recessive lethal tests showed that 4 of the 38 pesticides (captan, simazine, bromacil, and folpet) were positive for mutagenicity. Cacodylic acid was a questionable negative; but since it was also cytotoxic, insufficient data was available for its definite classification. Mouse dominant lethal tests gave no significant evidence of mutagenicity due to pesticide treatment.

81-0777. Saleh, M. A. (Dep. Agric. Biochem., Fac. Agric., Univ. Cairo, Giza, Egypt) **Mutagenic and carcinogenic effects of pesticides.** *J. Environ. Sci. Health B* 15(6): 907-927; 1980 (90 references).

The mutagenic, carcinogenic and teratogenic actions of some frequently used pesticides are discussed. Halogenated hydrocarbons, especially insecticidal fumigants, were found to be very dangerous. DBCP (dibromochloropropane) has been shown to cause sterility, while aldrin, dieldrin, BHC, mirex, chlordane, strobane (terpene polychlorinates) and chlordecone show marginal or definite carcinogenicity. Trichlorfon has been found to be carcinogenic while numerous other organophosphorus insecticides show mutagenic action. TCDD is highly mutagenic and carcinogenic. Maleic hydrazide is carcinogenic in rats and mice. DNA is known to be the site of action for the carcinogenic activity of many of the pesticides. Some mechanisms of mutagenicity and carcinogenicity for certain pesticides are discussed. Various mutagen and carcinogen assays are also considered.

81-0778. Sandhu, S. S.; Waters, M. D. (Health Eff. Res. Lab., Genet. Toxicol. Div., US EPA, Research Triangle Park, NC 27711) **Mutagenicity evaluation of chemical pesticides.** *J. Environ. Sci. Health B* 15(6): 929-948; 1980 (55 references).

Due to the increased use of pesticides and growing concern over the safety of these compounds, the US EPA has established the Rebuttable Presumption Against Registration Program to review data concerning the mutagenic potential of certain pesticides. A survey of the data in the literature on the mutagenic potential of maleic hydrazide, rotenone, monuron, diallate, triallate and

benomyl is presented and evaluated. Maleic hydrazide has been shown to disrupt the chromosomal integrity of plants, but the mechanism by which this occurs in not yet clear. Rotenone is known to inhibit microtubule assembly and therefore disrupt cell division. Monuron has been found to be an inducer of unscheduled DNA synthesis in human lung fibroblasts and a clastogenic agent in the somatic and germ cells of barley. Both diallate and triallate were mutagenic in the *Salmonella*/microsome test. Benomyl has proven mutagenic in a variety of bioassays. In mammals benomyl acts mainly as an antimitotic agent and shows no mutagenicity in dominant lethal tests due to its poor absorption.

81-0779. Cueto, C., Jr. (Tracor Jitco Inc., Rockville, MD 20852) **Consideration of the possible carcinogenicity of some pesticides.** *J. Environ. Sci. Health B* 15(6): 949-975; 1980 (3 references).

A review of the sophistication, sensitivity and predictability of various carcinogenesis assays in rats and mice is presented. Both male and female B6C3F1:C57BL/6xC3H F1 hybrid mice and male and female Osborne-Mendel or Fisher 344 rats were used to test 3 acaricides (chlorobenzilate, dicofol and dimethoate), 2 fungicides [captan and pentachloronitrobenzene (quintozene)], 2 fumigants [dibromochloropropane and 1,2-dibromethane (ethylene dibromide)], 4 herbicides (sulfallate, nitrofen, chloramben and trifluralin), 12 chlorinated insecticides and 5 organophosphorus insecticides. Tumor response data of each sex and strain to these pesticides is given and the incidence of spontaneous tumor formation is discussed. These findings suggest that the term carcinogenic can not be ascribed to a compound in general but must be applied to a specific interaction of a chemical and a biological system under a given set of conditions.

81-0780. Kimbrough, R. D. (Toxicol. Branch, Clin. Chem. Div., Bur. Lab., Cent. Dis. Control., US Public Health Serv., Dep. HEW, Atlanta, GA 30333) **Human health effects of selected pesticides, chloroaniline derivatives.** *J. Environ. Sci. Health B* 15(6): 977-992; 1980 (12 references).

The health effects of the chloroaniline derivatives chlordimeform and propanil to laboratory animals and humans are reviewed. Chlordimeform and its major metabolite, 2-methyl-4-chloroaniline, produce severe hemorrhagic cystitis in humans but have no such effects in cats. These two compounds had only a mild effect on the bladders and livers of dosed cats. Propanil has been shown to cause chloracne in chemical workers and hyperkeratosis of the rabbit ear, which resembles human chloracne. 3,4-Dichloroaniline also produced hyperkeratosis of the rabbit ear, and may be assumed to be chloracnegenic in humans as well. The chloracnegenic properties of propanil, 3,4-dichloroaniline and methazole were attributed to their common contaminants, 3,4,3′,4′-tetrachloroazobenzene or 3,4,3′,4′-tetrachloroazoxybenzene.

81-0781. Basol, M. S.; Eren, S.; Sadar, M. H. (Dep. Appl. Chem., Middle East Tech. Univ., Gaziantep, Turkey) **Comparative toxicity of some pesticides on human health and some aquatic species.** *J. Environ. Sci. Health B* 15(6): 993-1004; 1980 (15 references).

The concentration of a chemical needed to inhibit 50% of the acetylcholinesterase activity (I50 value) is often useful in comparing the toxic potential of various pesticides. I50 values were calculated for carbaryl, aldrin and malathion in *p*-nitrophenol acetate, propionate or butyrate substrates using electric eel derived or human or horse serum derived enzyme. The *p*-nitrophenyl acetate and butyrate substrates were found to be inadequate for comparative inhibition tests; all experiments were carried out using *p*-nitrophenyl propionate as substrate. The degree of inhibition was found to be dependent upon enzyme concentration. As enzyme level decreased, inhibition increased. Aldrin displayed very potent enzyme inhibitor characteristics when tested with acetylcholinesterase derived from all 3 sources. Carbaryl was found to be a less effective inhibitor than aldrin, but was much stronger than the very weak inhibitor, malathion. In general, findings indicated that *in vitro* inhibition studies of the same cholinesterase extracted from different sources may be a useful tool for comparing the toxicity of pesticides if experimental conditions are kept similar to those found in nature.

81-0782. Mitcham, R. P.; Shelley, M. W. (Author address not given) **The control of animals in water mains using permethrin, a synthetic pyrethroid.** *J. Inst. Water Eng. Sci.* 34(5): 474-482; 1980 (7 references).

Permethrin toxicity to the larvae of the insect *Paratanytarsus* sp. and adults of *Asellus aquaticus*, certain domestic aquarium fish (guppies, platies, and neon tetras), and young trout *(Salmo gairdneri)* was studied in laboratory tests designed to assess efficacy and safety to fish, of the insecticide as a water main biocontrol agent. Insects were exposed to permethrin dose levels ranging from 0.001-0.025 mg/l. Aquarium fish were exposed to dechlorinated tap water containing permethrin at levels of 0.025 mg/l. Trout exposed to permethrin dose levels of 0.025 mg/l showed no mortality; however, in these tanks water levels of permethrin were reduced when compared to tanks containing the insecticide but no fish. This effect was attributed to removal of permethrin by active surfaces on the fish. No mortality was noted among the aquarium fish at the permethrin dose tested. Permethrin toxicity to the insects tested showed a dose dependent relationship. Monitoring programs were conducted on water samples from Southend water mains to assess the effectiveness of the insecticide treatment on aquatic insects. *Paratanytarsus*

larvae, *Cladocera, Nais* and *Limnochares*, were present in numbers similar to those found when pyrethrin was used. Unlike pyrethrin, permethrin dosing of the water system prevented reinfestations of the water supply after a 90 wk period. These findings show the increased effectiveness of this synthetic pyrethroid in controlling pathogenic chironomids with detrimental effects on fish.

81-0783. Ando, M. (Natl. Inst. Environ. Stud., Yatabe, Ibaragi, Japan) **[Studies on the dynamic state of agricultural pesticides and PCBs in organisms and factors modifying them.]** *Kokuritsu Kogai Kenkyusho Nempo (Annu. Rep. Natl. Inst. Environ. Stud.):* p. 136; 1980 (4 references) (Japanese).

Due to the effects of interactions of various factors in the environment on the metabolism and excretion of persistent organochlorine chemicals, such as DDT and PCBs, the relationship between environmental cadmium and the metabolic behavior of organochlorine compounds was investigated. Cadmium was observed to modify lipid metabolism and therefore change the rate of organochlorine metabolism. In another study, the behavior of aerially applied agricultural pesticides was investigated. The amount of applied pesticide diminished with increased time. However, the pesticide was present in the ambient environment for several hr after application, diffused over a fairly broad area, and was found in nearby houses.

81-0784. Yasuno, M.; Hatakeyama, N.; Kasuga, S.; Miyashita, M.; Sugaya, Y. (Natl. Inst. Environ. Stud., Yatabe, Ibaragi, Japan) **[Studies on the development of toxicity test methods by aquatic organisms.] Part I. Effects of fenitrothion on egg-laying in guppy.]** *Kokuritsu Kogai Kenkyusho Nempo (Annu. Rep. Natl. Inst. Environ. Stud.):* pp. 145-146; 1980 (4 references) (Japanese).

Previous studies on guppies, exposed to temephos at low concentrations for 2 mo, resulted in high levels of egg toxicity and abortions. In this test, guppies were exposed to low concentrations, 0.25, 0.5 and 1.0 ppm, of fenitrothion for 2 mo to determine if all organophosphorus insecticides have similar affects on fish. Little or no toxicity to fish or adverse reproduction effects were observed in fish exposed to 0.25 ppm fenitrothion and then returned to a normal environment. In fish exposed to 0.5 or 1.0 ppm, abnormal reproduction cycles were observed up to 2 mo after exposure ended.

81-0785. Holnar, J.; Paksy, K. A. (Author address not given) **Tierexperimentelle beurteilung der akuten inhalationsgefahren von Pflanzenschutzmitteln. [Evaluation of the acute toxicity of inhaled pesticides in experimental animals.]** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 179-193; 1978 (16 references) (German).

The acute toxicity of inhaled pesticides in aerosol and dust form was studied in rats. The duration of the inhalation was 4 hr, the overall observation period 14 days. The LC50s of the aerosol of the organophosphorus pesticides tested was determined to be 16.1 mg/m³ for mevinphos, 34 mg/m³ for methyl parathion, 63 mg/m³ for monocrotophos, 90 mg/m³ for dicrotophos, 135 mg/m³ for phosphamidon, 165 mg/m³ for prothoate, 210 mg/m³ for demeton-S-methyl sulfone, 378 mg/m³ for fenitrothion, 500 mg/m³ for demeton-S-methyl, 700 mg/m³ for trichloronate, and 3,500 mg/m³ for diazinon. The LC50 of the fungicide and herbicide dusts was 403 mg/m³ for Elocron 50 WP (dioxacarb), 300 mg/m³ for dioxacarb 50 WP, 187 mg/m³ dioxacarb (technical grade), 2630 mg/m³ for Pol-Thiuram 85 WP (85% thiram) and 6000 mg/m³ for Satecid 65 WP (65% propachlor).

81-0786. Strohmayer, A.; Desi, I.; Farkas, I. (Author address not given) **Hygiene and toxicologic testing and criticizing methods of environment serving to prevent damages of pesticides applied in Hungarian agriculture.** In: *Konferenz ueber Sicherheitstechnik der Landwirtschaftlichen Chemisierung. Vortraege.* (OMKDK-Technoinform: Budapest): pp. 237-246; 1978.

Tests used in Hungary for determination of pesticide toxicity and for public health certification of pesticides are described. LD50 values were determined using rats. Irritating effects are studied on rabbit skin and eyes. Allergic reactions are examined in guinea pigs. After these tests, the semi-acute 90-day toxicologic tests are carried out according to classic toxicologic methods (treatment with 0.05, 0.025 and 0.125 of the LD50). Tests are also carried out to detect early mild functional defects. Neuro-toxicologic processes are the most sensitive; therefore, electro-physiological and psycho-physiological tests are considered to be very important. Data from these various tests is presented in graphic form. Figures include the effect of DDVP (dichlorvos) on EEC images; the effect of DDVP on cholinesterase activity of blood plasma, liver, red blood cells and brain; the effect of malathion on motor unit potentials; the effect of malathion on time taken and mistakes of rats in a labyrinth; the effect of Fundazol 50 WP on monkey kidney tissue culture; antibody levels and DDVP treatment; and the effect of pesticides on sensitive water organisms.

81-0787. Bennett, R. S., Jr. (Michigan State Univ., East Lansing, MI) **Agricultural pesticides and their influence on food preference and consumption by ring-necked pheasant.** *Masters Abstr.* 18(2): 67; 1980.

A total of 270 landowners in 3 Michigan counties responded to questionnaires concerning the use of agricultural pesticides. Of all the corn produced by these

landowners, insecticides were applied to 45% and herbicides to 90% of the crop. Various concentrations of captan, diazinon, Furadan (carbofuran), and lorsban (chlorpyrifos) were applied to foods offered to ring-necked pheasants, using free choice feeding trials. Untreated food was the first preference. Food with the least amount of contaminant was second choice.

81-0788. Zimmerli, B.; Marschall, T.; Marek, B. (Abt. Lebensmittelkontrolle, Sect. Pestizidrueckstaende & Kontam., Bundesamt Gesundheitwes., CH-3001 Bern, Switzerland) **Zur exkretion von oral verabreichtem pentachlorphenol in die Kuhmilch. [On the excretion of pentachlorophenol in cows milk.]** *Mitt. Geb. Lebensmittelunters. Hyg.* 71(3): 404-414; 1980 (33 references) (German).

A cow, in the fifth month of gestation yielding 12.4 kg milk/day, was fed a daily dose of 200 mg PCP (0.35 mg/kg body wt) over a period of 18 days. Milk samples were analyzed by the Erney and 3 other methods (different extractants and subsequent gas chromatography). No deleterious effects on milk production nor on the health of the subsequently born calf were observed. After 2 days PCP concentrations in the milk reached an equilibrium mean value of 240 μg/l. When dosing was discontinued PCP residues in milk returned to the basal level of ~ 10 μg/l within 6 days. Endogenous PCP found in all fresh raw milk can be recovered by the Erney extraction with benzene only to the extent of ~ 8%; this incomplete extraction is explained by the great affinity of PCP for proteins. Cow urine, which normally contains traces of PCP, increased to 3.2 mg/l during the experiment.

81-0789. Yamamoto, M. (Dep. Biophys., Fac. Sci., Kyoto Univ., Kyoto 606, Japan) **Genetic analysis of resistant mutants to antimitotic benzimidazole compounds in *Schizosaccharomyces pombe*.** *Mol. Gen. Genet.* 180(1): 231-234; 1980 (20 references).

Mutant strains of the fission yeast *Schizosaccharomyces pombe* were used in studies carried out on the benzimidazole fungicides methyl-2-benzimidazolecarbamate (MBC; carbendazim) and thiabendazole (TBZ), which are known to have antimitotic potency. Selection for a mutant strain resistant to TBZ is described. The strains developed were shown to differ phenotypically; one group (*ben1* and *ben3*) showed temperature dependent resistance. The location of *ben3* on chromosome II was determined by a haploidization method. Tetrad analysis determined the location of *ben1* at the rightmost part of chromosome II and *ben2* near the centromere of chromosome II. It is suggested that one of the mutant genes may code for tubulin.

81-0790. Witzemann, V. (Abt. Neurochem., Max Planck Inst. Biophys. Chem., D-3400 Gottingen, BRD) **Characterization of multiple forms of acetylcholinesterase in electric organ of *Torpedo marmorata*.** *Neurosci. Lett.* 20(3): 277-282; 1980 (15 references).

Extracts from the physio-electric organ of *Torpedo marmorata* were investigated for possible forms of acetylcholinesterase (AChE). The enzyme was extracted quantitatively when both non-ionic detergent and magnesium chloride were included in the extraction media. Three forms of the enzyme were identified with apparent sedimentation coefficients of 17S, 13S, and 6S. The 17S and 13S forms were only extractable at high salt concentrations. A non-ionic detergent such as Triton X-100 was needed to solubilize most of the 6S AChE. This form was more tightly associated with part or all of the cell membranes. In juvenile *Torpedo* the relative amounts of the hydrophobic form decreased in comparison to the other forms.

81-0791. Nakamura, K.; Nagai, M.; Hirase, F.; Saito, G.; Seto, Y. (Fac. Legal Med., Fac. Med., Takai Univ., Isehara, Kanagawa, Japan) **[A case report of an autopsy after intoxication with lead arsenate.]** *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.)* 34(2): 136-137; 1980 (Japanese).

A 25-yr-old man, found after apparently committing suicide, was examined for the causative agent. The patient had been on furasepam hydrochloride and imipramine medications. Findings upon autopsy were coloration of the gastric mucous membranes, and acute inflammation of, and the presence of a pale-blue powder in, the stomach. Arsenic was determined by the diethyl dithiocarbamate-silver method; large quantities of arsenic were detected in the stomach contents and other organs. The other medications were also detected in the contents of the stomach and blood, in amounts too small to be considered as the cause of death. Autopsy findings were obtained only on the esophageal and gastric mucous membranes; acute intoxication was considered to be a cerebro-spinal type. Death presumably occurred 2-3 hr after ingestion.

81-0792. Konno, N.; Yamauchi, T.; Kinebuchi, H. (Dep. Public Health, Fukushima Med. Coll., Fukushima, Japan) **[Change of concentration of leptophos in the nervous tissue of hens.]** *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 27(8): 367-372; 1980 (14 references) (Japanese).

Hens were singly dosed po with leptophos dissolved in cotton seed oil at 200, 400, 600, 800 or 1000 mg/kg. The hens were sacrificed at various intervals after dosing and the concentrations of leptophos in the blood and tissues were determined by gas chromatography. At 24 hr after administration of 400 mg/kg, leptophos was found, in order of greatest to least concentrations, in adipose tissue, heart, kidney, brain, muscles, liver and plasma. The concentration in brain was 0.66 ppm, 4 times that of plasma. Leptophos levels in the spinal cord at 24 hr after

administration of 20-1000 mg/kg were generally higher than in the brain. At low doses, concentrations of leptophos in the 2 organs correlated to the level of administration. However, at higher doses, leptophos translocation to these tissues did not increase. The concentration of leptophos in brain and spinal cord rapidly decreased. At 3 days, leptophos levels were 0.06 ppm in brain and 0.11 ppm in spinal cord. Leptophos could not be detected in either tissue 8 days after administration.

81-0793. Takekawa, T.; Oda, S.; Kaku, K.; Shiomyra, T.; Matsumoto, N.; Miwa, S.; Unoki, T.; Sasai, K. (Sch. Intern. Med. III, Fac. Med., Yamaguchi Univ., Ube, Yamaguchi, Japan) **[A case report of an autopsy after intoxication by paraquat dichloride.]** *Nippon Naika Gakkai Zasshi (J. Jpn. Soc. Intern. Med.)* 69(10): 1348; 1980 (Japanese).

A 38-yr-old man was hospitalized with chief complaints of pyrexia and hyperventilation. Consciousness was initially clear, but gradually deteriorated. Paraquat dichloride was detected in the urine upon hospitalization. Cyanosis of the extremities was moderate. Wet rales were heard in the the left lung field and verclo-like rales were heard in the lower dorsal left lung. Peritoneal dialysis was performed just after hospitalization and was then changed to forced diuresis by mannitol and lasix. Although the patient was kept in an oxygen tent from initial hospitalization, the arterial blood $P(O_2)$ never rose above 40 mmHg. Severe cyanosis and raised BUN were also observed. The patient died on hospital day 5. Upon autopsy, severe stagnation and edema were observed in both lungs with strong fibrosis in the alveolar septum of the left upper pulmonary lobe. Typical images of acute necrosis of the kidney tubules were observed, along with turbid swelling of the kidney tubule epithelium. No conspicuous changes in other organs were noticed.

81-0794. Hayashi, S.; Arai, Y.; Kondo, T.; Kurihara, H.; Makino, T.; Suzuki, Y. (Dep. Intern. Med., Isezaki Citizen Hosp., Isezaki, Gumma, Japan) **[Two cases of intoxication due to paraquat dichloride.]** *Nippon Naika Gakkai Zasshi (J. Jpn. Soc. Intern. Med.)* 69(11): 1486-1487; 1980 (Japanese).

Two cases of paraquat intoxication are described. A 32-yr-old woman intentionally swallowed 10 ml of 24% paraquat after a domestic argument. She was taken to the hospital 2 hr after ingestion. Gastric wash was performed and an adsorbent, a laxative, and forced diuresis were administered. No aggravation of the renal or hepatic functions occurred. The patient survived with no other remarkable pathologies. A 54-yr-old woman ingested 30 ml of 24% paraquat intentionally. She was admitted to the hospital 1 hr post-ingestion. Treatments were similar to the above case. Additionally, charcoal filter dialysis was performed. The patient developed abnormal renal and hepatic functions and later died. Chest X-rays showed an opaque area in the lungs.

81-0795. Yoshida, K.; Tanaka, Y.; Ikunuma, T.; Terukimatusu, S.; Kusano, E.; Asano, Y.; Hosoda, S. (Dep. Intern. Med. Circulatory Organs, Jichi Med. Coll., Jichi, Japan) **[A case report of survival after intoxication by paraquat.]** *Nippon Naika Gakkai Zasshi (J. Jpn. Soc. Intern. Med.)* 69(11): 1487; 1980 (Japanese).

A 40-yr-old woman accidentally ingested 2 mouthfuls of a 24% paraquat formulation. Emesis occurred immediately after ingestion and nausea and pharyngeal pain later developed. At 16 hr post-ingestion, an adsorbent was administered. At 40 hr post-ingestion, the patient was hospitalized with erosion and conspicuous coating of the oral cavity. Biochemical parameters upon admission were raised WBC; LDH, 564 IU/ml; total bilirubin, 1.5 mg/dl; BUN, 21 mg/dl; creatinine, 1.9 mg/dl; and $Pa(0_2)$, 69.9 mm Hg. Glycosuria and proteinuria were also evident. Paraquat was detected in the urine at 0.25 ppm. Urinary paraquat was later undetectable (24 hr post-admission). Abnormal clinical findings improved by hospital day 6. No abnormalities were noted on any chest X-rays. The patient was discharged after hospital day 6.

81-0796. Nakayama, J.; Akagawa, E.; Akitomi, K. (Ogoro First Hosp., Ogori, Yamaguchi, Japan) **[Two cases of acute intoxication due to agricultural pesticide.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 29(3): 548-549; 1980 (Japanese).

Two cases of accidental intoxication by insecticides are presented. A 42-yr-old woman was exposed to an insecticide-fungicide powder, containing 2% each of fenthion, *o*-sec-butylphenyl methylcarbamate (BPMC) and edifenphos, during application of 150 kg. Initial symptoms included headache, nausea and fainting. Clouding of consciousness, perspiration, pale and edematous face, miosis and occasional tonic convulsion were observed upon admission to the hospital. Serum cholinesterase activity was < 0.01 Δ-pH. Treatment included 2 ampuls of PAM iv upon admission to the hospital, 4 mg/day dekarodron for 6 days, 2 ampuls of atropine sulfate/30 min (6 times) and 1 ampul of atropine sulfate/hr (4 times). Serum cholinesterase activity was < 0.01 on August 29, 0.38 on September 7, 0.45 on September 8 (dehospitalization) and 0.82 on September 21. A 46-yr-old woman became intoxicated after application of 6-10 kg of an agricultural insecticide. Symptoms included nausea, loss of appetite and malaise. On September 5, serum cholinesterase activity was 0.12 Δ-pH. After treatment, activity was 0.77 (November 2).

81-0797. Okawada, N.; Yagasaki, K.; Kondo, T. (Dep. Ophthalmol., Hamamatsu Enshu Hosp., Hamamatsu,

Shizuoka, Japan) **[Ocular impairments due to an agricultural pesticide.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 29(3): 550-551; 1980 (6 references) (Japanese).

A 28-yr-old woman accidentally splashed paraquat in her eyes. The eyes were washed immediately with water. An ache in the eyes and swollen eyelids occurred 12 hr later. The patients was hospitalized 40 hr after the accident. Edemea of the eyelids, chemosis, edema of the corneal epithelia, and superficial and diffuse keratitis were observed upon admission. Treatment consisted of topical antibiotics in physiological saline solution 5-10 times/day, steroids 3 times/day, and systemic anti-inflammatory and sedation medications. Epithelial erosion developed on both central parts of the corneal and epithelial ablations developed on both eyes. The right and left corneas were completely recovered after 28 and 29 days, respectively. A 73-yr-old man accidentally splashed chloropicrin in his right eye. Edema of the right eyelid and cornea was severe, and the ocular conjunctiva began to partially liquefy with a bulbar adherence at 2 days after the accident. Treatment was similar to that in the first case described. The bulbar adherence was treated by an ablation operation. At 23 days after the accident, the cornea was thickened and turbidity from the recovered adhesion was observed.

81-0798. Kinebuchi, H.; Konno, N.; Yamauchi, T. (Sch. Public Health, Fukushima Med. Coll., Fukushima, Japan) **[Delayed neurotoxicity due to cyanofenphos, an organophosphorus insecticide.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 29(3): 570-571; 1980 (1 reference) (Japanese).

Delayed cyanofenphos neurotoxicity was studied in egg laying hens. Cyanofenphos was administered po to groups of 5 hens at rates of 100, 200, 400 and 600 mg/kg diluted in salad oil. In groups administered 100, 400 and 600 mg/kg as a single dose, 1 hen/group died after 7 days. After 10-17 days 1 hen in each of the 200, 400 and 600 mg/kg (single dose) groups showed slight ataxia. Ataxial symptoms did not develop into paralysis. Cyanofenphos was also administered to groups of hens in 4 portions, resulting in total doses of 200, 400 or 600 mg/kg. Ataxia appeared in 4, 3 and 4 hens of the 200, 400 and 600 mg/kg groups, respectively. After 13-25 days 2, 2 and 3 hens of the same groups showed paralysis. One hen from each group died after paralysis. Fatal acute toxicity was observed only in 2 and 1 hens of the 400 and 600 mg/kg groups. Although the mechanism of reinforcement of cyanofenphos neurotoxicity by administration of divided dose has not yet been elucidated, it is suggested that the degree of toxicity of organophosphorus pesticides should not be evaluated solely from acute toxicity data.

81-0799. Konno, N.; Yamauchi, T.; Kinebuchi, H. (Sch. Public Health, Fukushima Med. Coll., Fukushima, Japan) **[Concentration of leptophos in the nervous tissues of hens.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 29(3): 574-575; 1980 (2 references) (Japanese).

Neurotoxic symptoms and leptophos levels in the nervous tissues of adult hens administered 200-1000 mg leptophos po was studied. Average tissue leptophos levels 24 hr after administration of 400 mg/kg to hens were 0.66 in brain, 0.44 in muscle, 2.70 in heart, 0.19 in liver, 1.05 in kidney, 15.62 in adipose tissue and 0.15 ppm in plasma. Brain levels after doses of 200, 400, 600, 800 and 1000 mg/kg were 0.21, 0.62, 0.93, 0.65 and 0.76 ppm, respectively. The diminution of leptophos from brain and spinal cord after administration was fairly rapid; no leptophos was detected 8 days after administration of 400 mg/kg. However, ataxia was observed 15 days after administration in 3 of 4 hens given 400 mg/kg leptophos. It was concluded that leptophos had disappeared from hen nervous tissue by the time delayed neurotoxicity signs appeared.

81-0800. Kudo, Y.; Nakamura, I.; Nishida, N. (Sch. Hyg., St. Marianna Med. Coll., Kawasaki, Kanagawa, Japan) **[Changes of erythrocytic cells in peripheral blood of rabbits dosed with pesticides. Part 3.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 29(3): 578-579; 1980 (Japanese).

Rabbits were dosed im or sc with *m*-tolyl *n*-methyl carbamate (MTMC), chlorobenzilate, chlordimeform, methomyl, disulfoton, fenitrothion, zineb, thiophanate-methyl, butachlor, or nitrophenyl trichlorophenol ether (CNP), at 0.1 LD50 once; 0.1 LD50 once/day for 5 days; 0.01 LD50 once/day for 5 days; 0.01 LD50 once/day for 16 days; or 0.005 LD50 once/day for 16 days. Blood samples were collected daily and changes in the erythrocyte differential were examined by fluorescence spectrometry. The osmotic pressure resistance of the RBCs were also measured. Reticulocytes increased after either single or multiple administrations of all pesticides except methomyl. Punctate basoerythrocytes appeared only after multiple dosing with MTMC, chlorobenzilate, fenitrothion, thiophanate-methyl, butachlor and CNP. Erythrocyte resistance to osmotic pressure increased over 1-9 hr following administration of the single 0.1 LD50 dose of each pesticide. These results are consistent with changes observed in human blood samples collected from agricultural communities.

81-0801. Tsuge, S.; Nishimura, T.; Kazano, H.; Tomizawa, C. (Natl. Agric. Chem. Insp. Stn., Kodaira, Tokyo, Japan) **[Uptake of pesticides from aquarium tank water by aquatic organisms.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(4): 585-593; 1980 (13 references) (Japanese).

The uptake of pesticides by aquatic organisms was studied in the guppy (*Lebistes reticulatus* Peters), the red

snail (*Indoplanorbis exustus* Deshays, mosquito larvae (*Culex pipiens pallens molestus* Foriskal) and *Daphnia pulex* deGeer. Organisms were kept at 25°C in aquaria containing 1 ppb ^{14}C labeled DDT, aldrin, prothiophos, isothioate, carbaryl or XMC (3,5-xylyl methylcarbamate). Uptake of DDT was most rapid by mosquito larvae; accumulation was least in the snail. Aldrin was rapidly converted to dieldrin in the guppy. *Daphnia*, however, contained very low aldrin levels. The uptake of prothiophos was high in *Daphnia*, in contrast to the lesser uptake by other organisms which easily degraded prothiophos. The uptake of isothioate, carbaryl and XMC was fairly low; these pesticides were metabolized rapidly by all organisms tested. The uptake and metabolism of the pesticides tested was found to vary greatly with species. The direct uptake of a pesticide in this study did not correlate with previous results on the movement of the pesticide through a food chain in a model ecosystem.

81-0802. Fry, D. M.; Toone, C. K. (Dep. Avian Sci., Univ. California, Davis, CA 95616) **Teratogenic effects of DDT on the avian reproductive system.** *Pac. Seabird Group Bull.* 6(2): 45; 1979.

Eggs of California gulls, Japanese quail, and chickens were used in studies on teratogenic effects of DDT on the avian reproductive system. The yolks of fertile eggs were injected with a single dose of *o,p'*-DDT, a method chosen to most closely approximate the DDT contamination of eggs in the wild. Concentrations of 20-100 ppm caused feminization of the testes of males hatched from treated eggs. Females hatched from eggs treated with 20 ppm laid thin- or soft-shelled eggs, while females hatched from eggs treated with 100 ppm *o,p'*-DDT laid soft-shelled or no eggs at all. It is suggested that these effects are due to the fact that DDT mimics the hormone action of estrogen in mammals.

81-0803. Abbadie, D.; Colle, M.; Battin, J. (Clin. Mal. Enfants, Hop. Enfants, F-33077 Bordeaux, France) **Intoxication par les organophosphores. A propos d'une observation chez un enfant de 2 ans. [Intoxication by organophosphorus insecticides. A case history of a 2 year old infant.]** *Pediatrie* 35(6): 545-552; 1980 (10 references) (French).

The physiological and clinical aspects of a case of accidental poisoning of a 2-yr-old child with the organophosphorus pesticide mevinphos are described. The intoxication was characterized by sweating, hyperthermia, low pulse rate and blood pressure, repeated vomiting, ataxia, obnubilation, hyporeflexia and muscular contractions. Intoxication was characterized by a sharp drop in serum cholinesterase activity from 3-8 U/ml to 0.54 U/ml due to the replacement of the acetyl radical of the esterase site by the organophosphorus compound resulting in the formation of an enzyme organophosphorus complex. Detoxification was accomplished by the administration of contrathion (pralidoxime) which displaced the organophosphorus compound from the complex. As a result of gastric lavage, and the administration of atropine and contrathion, clinical symptoms disappeared on day 10 and the ChE activity returned to normal on day 18.

81-0804. Allen, J. R.; Barsotti, D. A.; Van Miller, J. P.; Abrahamson, L. J.; Lalich, J. J. (Author address not given) **Morphological changes in monkeys consuming a diet containing low levels of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** In: *The Pendulum and the Toxic Cloud. The Course of Dioxin Contamination.* Whiteside, T. (Yale Univ. Press: New Haven): pp. 168-177; 1979 (7 references).

Female rhesus monkeys were given a diet containing 500 ppt TCDD for 9 mo. After 3 mo, monkeys developed peri-orbital edema, loss of facial hair and eyelashes, accentuated hair follicles and dry scaly skin. By mo 6 these changes were more prominent, and decreased hemoglobin and hematocrit levels were observed. Blood urea nitrogen, total serum lipids, serum cholesterol, serum glutamic pyruvic transaminase, total serum protein and albumin-globulin ratios were not altered significantly. Animals that died had petechial hemorrhages over the entire body surface. Ascites was prominent in all animals with marked distension of the intrahepatic biliary system. The lungs evidenced focal hemorrhage in all lobes. Bilateral ventricular dilatation, cardiac enlargement and edema were present. Skeletal muscles were edematous, pale and discolored by hemorrhagic foci. Extensive hemorrhage was found in the meninges, and bone marrow had the appearance of fatty tissue in which focal areas of hemorrhage were present. Major microscopic changes included degeneration or atrophy of bone marrow and lymphopoietic tissues, hemorrhage and changes in cellular hypertrophy, hyperplasia, and metaplasia.

81-0805. Van Miller, J. P.; Lalich, J. J.; Allen, J. R. (Author address not given) **Increased incidence of neoplasms in rats exposed to low levels of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** In: *The Pendulum and the Toxic Cloud. The Course of Dioxin Contamination.* Whiteside, T. (Yale Univ. Press: New Haven): pp. 178-186; 1979 (15 references).

Various levels of TCDD were fed to male Sprague-Dawley rats. Concentrations used were 1, 5, 50, 500 or 1000 ppt TCDD or 1, 5, 50, 500 or 1000 ppb TCDD. The three highest levels produced death in all experimental animals between wk 2 and 4. Atrophy of the thymus and spleen, dilatation of common bile ducts and hemorrhage in the gastrointestinal tract were noted. Severe liver necrosis and cellular hyperplasia of the mucosa and edema in the wall of the common bile ducts were found. The high incidence of neoplasms in rats receiving subacute levels of

TCDD suggest that a carcinogenic potential exists. Tumors of the ductal epithelium and cholangiocarcinomas were consistent with findings on nonhuman primates. There is also the possibility that TCDD may be a neoplastic change promoter rather than in inducer.

81-0806. Elliot, M.; Farnham, A. W.; Janes, N. F.; Johnson, D. M.; Pulman, D. A. (Dep. Insecticides & Fungicides, Rothamsted Exp. Stn., Harpenden, Herts AL5 2JQ, England) **The pyrethrins and related compounds. Part XXIV. Synthesis, ^{13}C-nuclear magnetic resonance spectra and insecticidal activity of cycloalkyl analogues of fenvalerate.** *Pestic. Sci.* 11(5): 513-525; 1980 (18 references).

Close isosteres of fenvalerate [(*RS*)-α-cyano-3-phenoxybenzyl (*RS*)-2-(4-chlorophenyl)-3-methylbutyrate], in which cyclopropyl groups replace isopropyl have insecticidal activity close to or greater than the parent compounds, and diminished iv toxicity to rats. A direct toxicological relationship of these compounds to fenvalerate itself and to chrysanthemate esters is indicated by the consistently greater activity of esters from one of an enantiomeric pair of acids. Other esters with large alkyl or cycloalkyl groups, or spiropentane analogues of chrysanthemates are less active insecticides. ^{13}C-Nuclear magnetic resonance spectra suggest that in the α-cyanobenzyl esters there is an intramolecular through-space interaction in solution. The relationships between the chemical structures of the compounds synthesized and their relative activities to different insect species and toxicity to rats are discussed. (Author abstract by permission)

81-0807. Chamberlain, K.; Carter, G. A. (Rothamsted Exp. Stn., Harpenden, Herts AL5 2JQ, England) **The fungitoxicity of substituted 2-phenylbenzofurans.** *Pestic. Sci.* 11(5): 526-532; 1980 (11 references).

Thirty-seven 2-phenylbenzofurans, variously substituted in the homocyclic rings, were synthesized and assessed for antifungal activity in laboratory tests. High activity was shown only by compounds containing a hydroxy group, though amino compounds were also fungitoxic but at a lower level. Possible mechanisms by which these substitutions impart fungitoxicity are discussed with particular reference to the partitioning properties of the molecule. (Author abstract by permission)

81-0808. Brealey, C. J.; Walker, C. H.; Baldwin, B. C. (Wellcome Res. Lab., Berkhamsted Hill, Berkhamsted, Herts HP4 2QE, England) **A-esterase activities in relation to the differential toxicity of pirimiphos-methyl to birds and mammals.** *Pestic. Sci.* 11(5): 546-554; 1980 (18 references).

Pirimiphos-methyloxon (2-diethylamino-6-methylpyrimidin-4-yl dimethyl phosphate) the phosphate analogue of pirimiphos-methyl, and paraoxon (diethyl 4-nitrophenyl phosphate) the phosphate analogue of parathion were used as substrates to determine the esterase activity in plasma. Aryl groups released were measured by high-performance liquid chromatography or with a recording spectrophotometer. In a survey of 14 species of birds representing 6 different avian orders, the plasma esterase activities (expressed as nmol/min/ml of plasma) were always low, ranging from 0-71 for pirimiphos-methyloxon and from 0-0.63 for paraoxon. By contrast, mammalian activities were very much higher than these, and in no case was a sample of mammalian plasma less than 13 times more active than any sample of avian plasma using the same assay procedure. It is concluded that birds are deficient in A-esterase activity towards pirimiphos-methyloxon and paraoxon. The importance of this deficiency in determining the relatively high susceptibility of birds to these and other organophosphorus insecticides is discussed. (Author abstract by permission)

81-0809. Batora, I. (Clin. Occup. Med., Fac. Med., Bratislava, Czechoslovakia) **Pozdna neurotoxicita organickych zlucenin fosforu. [Delayed neurotoxicity of organic phosphorus compounds.]** *Prac. Lek.* 32(8): 286-288; 1980 (12 references) (Slovak).

The risk of poisoning by organophosphorus pesticides (OPP) during production and in agriculture during handling and application is evaluated. Symptoms of AChE blockage on synapses appear within minutes to hours following exposure. A characteristic of OPP poisoning is also delayed neurotoxicity, which appears in experimental animals (chickens) 8-14 days after ingestion. Many instances of delayed poisoning of humans resulting from the intake of trichlorfon (tri-*o*-cresylphosphate) are known. Delayed symptoms start with gradual paralysis of upper and lower limbs leading to severe atrophy of arm and leg muscles. Trichlorfon was found to be more toxic to humans than to chickens. The delayed neurotoxic effect is attributed to the inhibition of esterase in neural tissues as a result of phosphorylation or phosphonylation leading to a covalent bond on its active center which in turn leads to a malfunction of physiological processes resulting in nerve damage. Various theories have been advanced to explain the mechanism of neurotoxicity; inhibition of the transport of metabolic factors from the neural cell to the distal axon of proteins is postulated.

81-0810. Anonymous **Acenaphthene.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 46-47; 1980 (3 references).

Current information is presented on acenaphthene, one of 65 priority pollutants identified by the EPA. Its structural formula is given, along with its chemical and

physical properties. Acenaphthene is used as a dye intermediate, in the manufacture of some plastics, and also as an insecticide and fungicide. Its toxic actions include effects on the growth of plants and several microorganisms by causing improper nuclear division and polyploidal chromosome number. In toxicity tests on bluegill fish, acute values have been determined to be 1700 μg/l, with a bioconcentration factor of 397. Virtually no incidences of human acenaphthene toxicity have been noted. Little information is available regarding the prevalence of acenaphthene, but it has been detected, among other places, in urban city air, in coal tar, and in wastewater from petrochemical, pesticide and wood preservative industries. It is suggested that people working with coal tar and/or its products are possibly at risk. Although very little research has been carried out regarding human health effects, ambient water criterion for protection of human health has been determined to be 20 μg/l.

81-0811. Anonymous **Acrylonitrile.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 51-57; 1980 (22 references).

Current toxicological information is presented on acrylonitrile, one of 65 priority pollutants identified by the EPA. Its physical and chemical properties are described, along with its uses and occurrence. The major use of acrylonitrile is in the manufacture of copolymers for the production of acrylic and monacrylic fibers. It was also used as a fumigant until the registrations were withdrawn in August, 1978. In addition to occupational exposure, the public is exposed to acrylonitrile when polymers are burned for disposal, by leaching of monomer from food/packaging and in cigarette smoke. The compound is acutely toxic to fish at concentrations as low as 10,000 μg/l, and has been shown to be embryotoxic, mutagenic and teratogenic in laboratory animals. Acrylonitrile is suspected of being a human carcinogen; an epidemiologic study of acrylonitrile polymerization workers showed a substantial excess of risk (twice the expected) of lung and colon cancer. It is estimated that at least 125,000 individuals are exposed occupationally; exposed groups include pesticide and fumigant manufacturers and sprayers, and farmers. The basis for proposed human health criteria is discussed, and existing guidelines for various countries are presented.

81-0812. Anonymous **Aldrin/dieldrin.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 58-63; 1980 (11 references).

Current information on the cyclodiene insecticides aldrin and dieldrin, which are among 65 priority pollutants identified by the EPA, is presented. Their structural formulas are given, as are their physical and chemical properties. Both compounds were used for control of corn pests and by the citrus industry until 1974, when registration was suspended. Both aldrin and dieldrin are acutely toxic to most forms of life, including arthropods, mollusks, invertebrates, amphibians, reptiles, fish, birds and mammals. Dieldrin is extremely persistent in the environment. In the United States, aldrin and dieldrin have been found in more than 85% of the air samples tested, with levels as high as 2.8 ng/m³. Recent water samples contained aldrin or dieldrin in amounts up to 0.05 μg/l. It is noted that children may be especially at risk, since they have high dairy product diets; these diets have been shown to contain dieldrin. Existing guidelines call for a time-weighted average of 250 μg/m³ for skin absorption, and drinking water standards of 17 μg/l. The basis for proposed human health criteria is discussed.

81-0813. Anonymous **Arsenic.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 70-78; 1980 (13 references).

Toxicological information is presented on arsenic, one of 65 priority pollutants identified by the EPA. Its physical properties, chemical properties, and use (including as a fungicide and wood preservative) are described. Toxic effects are discussed, including the possible causal relationship between skin cancer and high exposure to inorganic arsenic compounds. The EPA has found that 68.8% of residential tap water samples collected had arsenic levels > 0.1 μg/l (average 2.37 μg/l). There is a wide diversity in the estimates of daily intake of arsenic in foods, ranging from 25 to 1000 μg/day. Daily airborne arsenic levels in uncontaminated areas are 21 to 1760 ng. The existing guidelines allow levels of 50 μg/l arsenic in drinking water supplied by interstate water carriers. For airborne arsenic, 0.5 mg/m³ has been set as the threshold limit value time weighted average (TLV-TWA). The basis for proposed human health criteria is described in detail.

81-0814. Anonymous **Chlordane.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 112-115; 1980 (12 references).

Current toxicological information is presented on the broad spectrum insecticide chlordane, one of 65 priority pollutants identified by the EPA. Its chemical structure is given, along with its physical and chemical properties. A registration suspension notice for all food crops and home and garden uses of chlordane was issued, but registration cancellation proceedings have allowed limited use as an agricultural insecticide through 1980. Chlordane is toxic to aquatic organisms, avian and mammalian species, and shows carcinogenic activity in mice. It is known to persist for long periods and to bioconcentrate in aquatic species. A total daily intake of 9 μg chlordane/day has been estimated, and it is suggested that children (because of high

milk consumption), fishermen, persons living downwind from treated fields, and persons living in houses treated with chlordane pesticides are especially at risk. Existing guidelines include a time-weighted average value of 0.5 mg/m³ for chlordane based on inhalation exposure. The acceptable daily dose for man has been estimated to be 0.001 mg/kg body wt. The basis for human health criteria is also discussed.

81-0815. Anonymous **Chlorinated benzenes.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 115-124; 1980 (13 references).

Current toxicological information is presented on the chlorinated benzenes, which are among 65 priority pollutants identified by the EPA. Hexachlorobenzene (HCB) and 1,2,4,5-tetrachlorobenzene are used as herbicides, monochlorobenzene is used in the synthesis of DDT, and 1,2,4,5-tetrachlorobenzene is used in the synthesis of 2,4,5-T. Chlorinated benzenes can irritate the skin, cause drowsiness, incoordination, unconsciousness, and liver, kidney and lung damage. Current levels of exposure, specific groups at risk, and existing guidelines and standards are given for five different compounds. It is noted that HCB is distributed worldwide, with the highest levels found in agricultural areas devoted to wheat and other cereal grains, and then in industrial areas. Groups at risk include those occupationally exposed during manufacture or disposal of HCB, and infants, who may consume human milk containing HCB. Food intake appears to be the primary source of the body burden of HCB for the general population. The basis for the proposed human health criteria is discussed.

81-0816. Anonymous **Chloroalkyl ethers.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 132-140; 1980 (17 references).

Toxicological data are presented on the chloroalkyl ethers, which are among 65 priority pollutants described by the EPA. The chemical properties of these compounds are described, and the physical constants for the 4 most environmentally significant chloroalkyl ethers are given. The chloroalkyl ethers have a wide range of uses, including pesticide manufacture, and the use of bis (2-chloroethyl) ether (dichloroethyl ether; BCEE) as an insecticide, acaricide and soil fumigant. Chloromethyl methyl ether (CMME) and bis (chloromethyl) ether (BCME) are both listed as 2 of the 14 carcinogens restricted by federal regulations. Most exposure to these compounds is considered to be occupational, but the general public may be exposed when their water source is contaminated river water and water treatment is inadequate to remove the contaminants. A TLV of 1 ppb has been recommended for BCME, and the federal standard for BCEE is 15 ppm. The basis for proposed human health criteria is discussed in detail.

81-0817. Anonymous **Chlorinated phenols.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 143-148; 1980 (9 references).

Toxicological data are presented on the chlorinated phenols, which are among 65 priority pollutants identified by the EPA. The method of synthesis and principal uses are presented for the seven commercially most important chlorinated phenols. Several of the compounds are used to produce herbicides, and four (2,4,5-TCP, 2,4,6-TCP, 2,3,4,6-TCP and PCP) are used directly as pesticides. It is noted that the highly toxic polychlorinated dibenzo-*p*-dioxins may be formed during the chemical synthesis of some chlorophenols. Chlorophenols, their sodium salts, and certain chlorocresols have been shown to be toxic to aquatic life, mammals and man. Groups especially at risk for the tetrachlorophenols include manufacturers, users of wood sawmills, and wood treaters. No standards have been established for monochlorophenols, dichlorophenols, tetrachlorophenols, or chlorocresols. An ADI of 0.1 mg/kg has been determined for 2,4,5-trichlorophenol. The basis for proposed human health criteria is described in detail for the various compounds, and the recommended water quality criteria for the chlorophenols (in μg/l) are 2,4,5-trichlorophenol, 10; 2,4,6-trichlorophenol, 100; and 2,3,4,6-tetrachlorophenol, 263.

81-0818. Anonymous **DDT.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 170-176; 1980 (15 references).

Current toxicological information is presented on DDT, one of the 65 priority pollutants identified by the EPA. The structure of DDT and its isomers is given, along with its physical and chemical properties. This broad spectrum insecticide has been used extensively worldwide. Agricultural use of DDT was cancelled in the United States in 1972, due to its long-term persistence and ability to accumulate in fat of wildlife and humans. DDT is acutely toxic to freshwater fishes at concentrations as low as 0.8 μg/l, and to invertebrates at 0.18 μg/l. Human exposure to DDT is primarily by ingestion of contaminated foods, with air and water intake negligible. EPA estimates the average US resident has a total yearly intake of 3 mg DDT. Although the entire US population is at risk to low exposure levels, the groups most at risk include workers in manufacturing and formulating plants, applicators, handlers, and sprayers. The chronology of DDT regulation is given, ending with the final acute (0.41 μg/l) and chronic (0.00023 μg/l) values for water quality criteria for protection of aquatic life established in 1978.

81-0819. Anonymous **Dichlorobenzenes.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.*

Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 177-182; 1980 (13 references).

Toxicological information is presented on dichlorobenzenes, which are among the 65 priority pollutants identified by the EPA. The major uses of 1,2-DCB are as a process solvent in the manufacturing of toluene di-isocyanate, and as an intermediate in the synthesis of dyestuffs, herbicides and degreasers. 1,4-DCB is used primarily as an air deodorant and insecticide. The dichlorobenzenes have been shown to be toxic to non-human mammals, birds and aquatic organisms, and their toxic effect in humans include hemolytic anemia and liver necrosis. Those considered to be specifically at risk are those individuals with pre-existing pathology, those taking certain drugs, or those directly exposed by occupation or by domestic use. Although data on current levels of exposure are limited, annual uptake in moderate cases was estimated to be 1.04×10^{-3} mg/kg by water and 14 mg/kg by air. The existing standards and guidelines are summarized, and the basis for proposed human health criteria is discussed. The ambient water criterion has been determined to be 230 μg/l total dichlorobenzene (all isomers included).

81-0820. Anonymous **Dichloropropanes/dichloropropenes.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig. M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 192-196; 1980 (3 references).

Toxicological data are presented on the dichloropropanes and dichloropropenes, which are included among the 65 priority pollutants identified by the EPA. Physical and chemical properties of these compounds, which are used as soil fumigants for the control of nematodes, are given. The toxic effects are dependent on the isomer and the individual organisms; accumulation in mammals is suggested to be unlikely. Both dichloropropanes and dichloropropenes have been shown to be mutagenic, but have a low tumor-causing potential. A list of occupations specifically at risk includes fumigant workers. Existing guidelines include a TWA standard for propylene dichloride of 75 ppm and for dichloropropane of 1 ppm. The basis for proposed human health criteria is discussed; it consists primarily of an inhalation no-observed-adverse- effect-level in rats and an uncertainty factor of 100. The proposed human health criteria are 0.6 μg/l for dichloropropene and 200 μg/l for propylene dichloride.

81-0821. Anonymous **Endosulfan.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 208-213; 1980 (10 references).

Current information on the broad spectrum insecticide endosulfan, one of 65 priority pollutants identified by the EPA, is presented. Physical and chemical properties and uses are described. Endosulfan is highly toxic to fish and marine invertebrates, and is readily absorbed by sediments. Maximum values reported in water samples have ranged from 0.011 μg/l in Canadian water systems to 0.83 μg/l in Ontario municipal water samples. During 1965-1970, daily intake of endosulfan from food sources was estimated to range from < 0.001 to 0.001 mg/day. Endosulfan residues have been found in tobacco products; residues in cigarettes averaged 0.83 mg/kg in 1973. Human risk is evaluated from residues in food, air and water; residues in tobacco products; and occupational exposure (dermal and respiratory). It as been recommended that environmental levels of endosulfan should not be permitted to rise above 0.05 μg/l. The basis for proposed human health criteria is discussed; toxicity studies on various biochemical parameters are summarized. The ambient water criterion for the protection of human health has been determined to be 0.1 mg/l endosulfan.

81-0822. Anonymous **Endrin.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 213-217; 1980 (13 references).

Current toxicological data are presented for the pesticide endrin, one of 65 priority pollutants identified by the EPA. Its structure is presented, along with its physical and chemical properties and uses. Due to its persistence, endrin utilization has been increasingly restricted and production has declined. Endrin is toxic to all animals; the major toxic affect is on the central nervous system. It is acutely toxic to carp at 0.046 μg/l and chronically toxic to grass shrimp at 0.038 μg/l. Field applications of endrin at 0.55 and 2.75 kg/ha resulted in the death of 33-100% of wild mice in the test area. Sublethal effects on wildlife include behavioral and reproductive disorders. The literature reports no malignancies attributable to endrin, but chromosomal aberrations, teratogenesis, growth retardation and increased fetal mortality have been observed in rats and mice. Human poisoning outbreaks have resulted from food contaminated with as low as 0.2 mg endrin/kg body wt. Endrin exposure is found to be decreasing. Of 500 drinking water samples tested, the number containing endrin levels > of 0.1 μg/l decreased from 23 during 1964-1965 to none during 1966-1967. Exposure from food and from air have also decreased. Groups likely to be exposed to endrin include agricultural workers, home gardeners, and those involved in its manufacture and distribution. Evidence of possible chromosome damage suggests that men and women of child-bearing age may also be at special risk. Information is presented on existing and proposed standards and guidelines.

81-0823. Anonymous **Halomethanes.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig,

M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 227-236; 1980 (28 references).

Current toxicological information is reported for halomethanes, which are among the 65 priority pollutants identified by the EPA. Seven compounds were chosen for discussion, among them chloromethane, which is used as a chemical intermediate in the production of herbicides, and bromomethane (methyl bromide), which is used as a fumigant. Physical and chemical properties, occurrence and uses are described. Chloromethane (methyl chloride) has been shown to be toxic to aquatic organisms at levels of 270,000 to 550,000 μg/l, and is highly mutagenic to the bacteria *Salmonella typhimurium*. In humans its main toxic action is on the central nervous system. Bromomethane is toxic to aquatic organisms at 11,000-12,000 μg/l and is also mutagenic to *S. typhimurium*. Inhalation is the usual route of systemic poisoning; symptoms include eye irritation, nausea and irrational behavior. Data are not sufficient to estimate total human exposure to these compounds. Existing guidelines and standards are discussed, and the proposed EPA criteria are presented. For the protection of human health, it has been proposed that the criteria be set at 2 μg/l for both chloromethane and bromomethane. The basis for the proposed human health criteria is discussed in detail.

81-0824. Anonymous **Heptachlor.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 236-240; 1980 (8 references).

Current toxicological information is presented on the chlorinated cyclodiene insecticide heptachlor, one of the 65 priority pollutants identified by the EPA. Its chemical structure and chemical and physical properties are given. The EPA issued a registration suspension notice for all food crop and home uses of heptachlor in 1976, but significant commercial use for termite control and protection of nonfood plants still exists. Heptachlor has been shown to bioconcentrate in the food chain, and has been found in human milk samples. Heptachlor is known to persist for long periods of time in the environment, is highly toxic to aquatic organisms, and exhibits carcinogenic activity in mice. Heptachlor has been detected in the major river basins of the United States at a mean concentration of 0.0063 μg/l. A 1967-1968 study showed that heptachlor, or its metabolite heptachlor epoxide, were found in 32% of 590 fish samples examined, with residues ranging from 0.01 to 8.33 mg/kg. In addition to individuals living near heptachlor-treated areas, infants are thought to be especially at risk due to heptachlor residues in human milk, cow milk and commercially prepared baby foods. The existing guidelines and standards for heptachlor exposure and proposed EPA criteria are presented.

81-0825. Anonymous **Hexachlorocyclohexane (BHC) (HCH).** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 244-250; 1980 (4 references).

Information is presented on the toxicity of hexachlorocyclohexane (BHC), which is one of the 65 priority pollutants identified by the EPA. BHC is a broad spectrum insecticide; the γ-isomer of 1,2,3,4,5,6-BHC (lindane) is the most active. Physical and chemical properties are described, along with its insecticidal uses. BHC is a persistent stomach poison; its mammalian toxicities depend upon the isomer. Acute oral LD50 values for γ-BHC are 88 mg/kg for male rats and 91 mg/kg for female rats. It is predicted that exposure will continue to decrease due to the steady decline in the use of these organochlorine insecticides. The α- and β-isomers represent a problem due to their accumulation in the food chain. No γ-BHC is currently being manufactured in the United States, so exposure in this country occurs only through use, handling or ingestion of contaminated food. Existing guidelines and standards for BHC exposure are described, and proposed EPA criteria are summarized.

81-0826. Anonymous **Isophorone.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 255-259; 1980 (9 references).

Current information is presented on isophorone, which is one of 65 priority pollutants identified by the EPA. It is used as a solvent or cosolvent for pesticides, herbicides, lacquers, gums, and other substances. Its physical and chemical properties and uses are discussed. Isophorone has been detected in drinking water, in the Delaware River, and in the effluents of several industrial effluents, but not in ambient air, soil or food. This compound has been reported to be toxic to aquatic organisms and mammals in acute, subacute and chronic toxicity tests. Only limited exposure data are available, but an average intake of 21.8 μg/day can be estimated by using data on isophorone levels in drinking water. Certain occupationally exposed groups, especially those exposed to isophorone as a solvent, show elevated levels of risk relative to the general population. Existing guidelines and standards are described, and the proposed EPA criteria are summarized. For the protection of human health, the EPA has proposed that the water quality criterion be set at 460 μg/l.

81-0827. Anonymous **Naphthalene.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 273-276; 1980 (10 references).

Current toxicological data are presented on naphthalene, which is one of the 65 priority pollutants identified by the EPA. It is used as an intermediate in the production of dye compounds and the formulation of solvents, lubricants and motor oils, and directly as a moth repellent and pesticide. Its physical and chemical properties

and occurrence are described. Naphthalene is reported to be toxic to microorganisms and to various aquatic vertebrates and invertebrates. In mammals and humans in the laboratory, naphthalene has been linked to various blood disorders and is suspected of crossing the placental membrane in humans. Naphthalene has been shown to bioconcentrate in aquatic organisms, and has been detected in ambient water (up to 2.0 μg/l) and in drinking water (up to 1.4 μ/l). It is noted that groups especially at risk include those with allergic hypersensitivity, newborn infants, and individuals with G6PD deficiency, which would make them more susceptible to hemolytic anemia upon exposure to naphthalene. At present there is only one United States standard for naphthalene exposure; 10 ppm of vapor pressure for a time-weighted industrial exposure, set by the Occupation Safety and Health Administration. The proposed EPA criteria are summarized. The proposed water criterion is 143 μg/l.

81-0828. Anonymous **Nitrophenols.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 282-289; 1980 (7 references).

Current data on nitrophenols, which are among 65 priority pollutants identified by the EPA, are presented. Physical and chemical properties of the mono-, di-, and trinitrophenols and of 4,6-dinitro-*o*- cresol (DNOC) are described. The nitrophenols have a wide variety of uses, including the use of 4-nitrophenol in the manufacture of ethyl and methyl parathions, 2,4-dinitrophenol as a chemical intermediate in the production of pest control agents and wood preservatives, 2,4,6-trinitrophenol (picric acid) as a fungicide, and DNOC as a fungicide and insecticide. None of the nitrophenols considered are known to be carcinogenic, mutagenic or teratogenic, but they are toxic to microorganisms, fish and mammals. Human exposure to nitrophenols generally has not been monitored, but 4-nitrophenol has been detected in the urine of 1.7% of the general population at levels as high as 0.1 mg/l (mean urinary level of 10 μg/l). Groups considered to be at risk are those occupationally exposed. In the case of DNOC, which is highly toxic to humans and is no longer produced in this country, exposure is limited to only about 3000 workers involved in formulating and spraying the compound. No standards currently exist in this country for drinking or ambient water, but the maximum air concentration permissible is set at 0.1 mg/m^3 for 2,4,6-trinitrophenol and 0.2 mg/m^3 for DNOC for an 8-hr exposure (TLV).

81-0829. Anonymous **Pentachlorophenol.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 297-300; 1980 (4 references).

Current toxicological data are presented on pentachlorophenol (PCP). PCP is a bactericide and fungicide, and is used primarily for the preservation of wood. Its chemical and physical properties and occurrence are described. PCP has been shown to be highly toxic to man, mammals, and aquatic life. Bioconcentration factors ranging from 13 to 1000 have been determined for freshwater and marine vertebrates. Based on known current levels of exposure, it is estimated that a 70 kg human would consume ~ 15 μg from food and 120 ng from water daily. Workers involved in the manufacture, formulation and use of PCP show greater exposure; PCP levels in their urine were greater compared to levels of the general population. Existing guidelines and standards are described, and the proposed EPA criteria are summarized. For the protection of human health, the ambient water criterion is proposed to be 140 μg/l. The basis for the proposed human health criteria is described in detail.

81-0830. Anonymous **Selenium.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp: Park Ridge, NJ): pp. 324-328; 1980 (14 references).

Current toxicological data is presented on selenium, one of 65 priority pollutants identified by the EPA. Selenium is a naturally occurring element and the major source of selenium is the weathering of rocks and soils, but human activities contribute about 3500 metric t/yr. Selenium is used in photocopying, the manufacture of glass, electronic devices, pigments, dyes and insecticides. Selenium is acutely toxic to fish and aquatic invertebrates, is known to produce tumors in animals, and is listed as a carcinogen. Selenium is an essential nutrient for humans, but is toxic in excessive amounts, with symptoms in man similar to those of arsenic. The average daily adult intake of selenium has been estimated at 130 to 150 μg, but is dependent on the levels of selenium in the local soil and water. Selenium in ambient air does not contribute significantly to the overall selenium exposure. The existing guidelines and standards for selenium exposure are summarized, as are proposed EPA criteria. For the protection of human health, the ambient water criterion has been determined to be 10 μg/l. The basis for the proposed human health criteria is discussed in detail.

81-0831. Anonymous **2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD).** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 333-336; 1980 (5 references).

Current toxicological information on 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD), one of the 65 priority pollutants identified by the EPA, is presented. Its chemical structure and physical and chemical properties are presented. TCDD has no uses as such, but is an inadvertant contaminant of herbicide precursors, and has been reported as a contaminant of 2,4,5-T, 2,4,5-T esters, silvex,

2,4-D and clophen. This persistent chemical is one of the most toxic substances known. It has been shown to be acnegenic, embryolethal, teratogenic, mutagenic, carcinogenic, and to effect mammalian immune response. It is highly lethal at low doses to aquatic organisms, birds and mammals (including man). One study has shown that chlorinated dioxins, including TCDD, were found in every sample of particulate matter taken from the air emissions of a wide variety of commercial and domestic combustion processes. Special risk groups include those workers exposed to TCDD-contaminated products, women of childbearing age, and children. Currently there are no guidelines or standards other than a calculated acceptable daily intake of 10^{-8} μg/kg/day for TCDD.

81-0832. Anonymous **Thallium.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 340-344; 1980 (6 references).

Current information is presented on thallium, which is one of the 65 priority pollutants identified by the EPA. Its uses and physical and chemical properties are described. Thallium has industrial uses in the manufacture of alloys, electronic devices, and special devices, and is used as a rat poison and ant bait. Recent analysis of household tap water samples indicates that thallium is present at an average concentration of < 1 μg/l in $< 1\%$ of all samples. Thallium has been shown to be chronically toxic to fish at concentrations as low as 20 μg/l. In humans, symptoms of acute exposure include alopecia, ataxia, and tremors, occasionally leading to irreversible coma and death. Although data on current exposure levels are scarce, some approximations of human exposure are possible. On the basis of food, water, and air exposure, the estimated daily adult intake is ≤ 6 μg/day. Excretion data give an estimation of 1.64 μg/day, and body burden data shows 2.3 μg/day. There is no evidence that one age group is more susceptible than another, but it does appear that smokers may have twice the level of thallium intake as nonsmokers. A threshold limit value of 0.1 mg/m³ has been established for thallium in workplace air. There are no current criteria for irrigation water, drinking water, fresh water or other media. The proposed EPA criteria are summarized, and it is noted that for the protection of human health, the proposed ambient water criterion is 4 μg/l. The basis for the proposed human health criteria is discussed in detail.

81-0833. Anonymous **Toxaphene.** In: *Priority Toxic Pollutants: Health Impacts and Allowable Limits.* Sittig, M., ed. (Noyes Data Corp.: Park Ridge, NJ): pp. 348-353; 1980 (6 references).

Current toxicological data is presented on toxaphene, which is among the 65 priority pollutants identified by the EPA. The structure, occurrence, physical and chemical properties, and uses of this chlorinated camphene insecticide are given. Toxaphene is currently the most heavily used insecticide in the United States, with annual production exceeding 100 million pounds. For various reasons, quantitative estimates of human exposure to toxaphene are difficult to make based on the data available. Toxaphene is toxic to many aquatic vertebrate and invertebrate species; bioconcentration factors as high as 91,000 have been reported. Toxaphene also has been demonstrated to be carcinogenic in laboratory animals. There are no firm data to support the assumption that individuals living in high use areas or individuals occupationally exposed are at greater risk than the general population. Existing standards and guidelines are discussed, and tolerances are given for various food products.

81-0834. Giri, A. K.; Banerjee, R.; Talukder, G.; Sharma, A. (Dep. Pathol. & Bacteriol., Inst. Post-Grad. Med. Educ. & Res., Calcutta 700020, India) **Mutagneic effects of certain common metal toxicants on mammalian systems.** *Proc. Indian Acad. Sci. (Anim. Sci.)* 89(4): 311-331; 1980 (203 references).

The mutagenicities of certain metals in mammalian systems are reviewed. Sources of metal pollutants (including arsenic-containing pesticides and herbicides), testing methods, and mode of action are considered. An extensive list of the effects of certain common metals on mammalian systems is presented in tabular form. Specific metals covered are nickel, cobalt, arsenic, selenium, vanadium, rubidium, cerium and molybdenum in many forms and uses. Mice, rats, rabbits, hamsters, horses, guinea pigs, and dogs were tested at the cell, tissue, organ and whole organism level. The relative activities of a large number of metals and the interactions of metals were also discussed. It is suggested that differences in test systems may account for variations in the results presented.

81-0835. Popper, H.; Gerber, M. A.; Schaffner, F.; Selikoff, I. J. (Stratton Lab. Study Liver Dis., Mount Sinai Sch. Med., City Univ. New York, New York, NY) **Environmental hepatic injury in man.** *Prog. Liver Dis.* 6(CH14): 605-638; 1979 (290 references).

A review of information on liver injury due to environmental agents is presented. Environmental agents in the human food chain undergo biochemical transformations in the liver. Evaluation of hazards to humans is accomplished by extrapolation of animal data to man. Hexachlorobenzene-induced porphyria and organochlorine insecticide-induced hepatocellular tumor have been observed in rats. Liver damage often results from altered metabolism. This is suggested to be the mechanism of dioxin toxicity. The patterns of liver diseases are discussed. Central necrosis caused by large doses of DDT is considered. Chronic liver disease has been caused by a large variety of materials; the accidental release of dioxin in the area of Seveso, Italy, is given as an example. Elevated DDT

and dieldrin have been noted in diseased livers, but this is suggested to be related to lipid content. No evidence has been found that relates chronic liver disease to DDT, aldrin, dieldrin or chlordecone. The sequence of clinical events in the liver that occurs after exposure to arsenic is also presented.

81-0836. Morgan, D. P. (Dep. Prev. Med. & Environ. Health, Univ. Iowa, College Med., Iowa City, IA 52240) **Minimizing occupational exposure to pesticides: acute and chronic effects of pesticides on human health.** *Residue Rev.* 75: 97-102; 1980 (2 references).

There are now available methods for recognizing the acute health hazards of many pesticides, using chemical, enzymologic, and clinical observations. Techniques for minimizing personal absorption of toxic chemicals are also known, but have not been as widely practiced among agricultural workers as in industrial settings. The virtual impossibility of predicting all chronic hazards of pesticide absorption generates a strong incentive for efficient protection of workers at all levels of exposure, whether acute effects are manifest or not. (Author abstract by permission)

81-0837. Molina, C. (Clin. Pneumo-phtisiol., Hop. Sabourin, F-63018 Clermont-Ferrand, France) **Fibroses interstitielles diffuses. Classification etiologique et evolutive. [Etiological and evolutionary classification of interstitial diffuse fibroses.]** *Rev. Prat.* 30(49): 3341-3342, 3345-3346, 3349-3350; 1980 (10 references) (French).

Classification of diffuse interstitial fibrosis (desquamative interstitial pneumonia; DIF) manifested by hardening of pulmonary alveolar walls by origin and course of affliction is attempted. The mechanism includes stages of interstitial and alveolar edema, hyaline membrane involvement and diffuse interstitial fibrosis characterized by irreversible lesions of the fibroblast or collagen type. DIF can be caused by viruses, toxic gases, ingestion of toxic agents, drugs, ionization radiation, inorganic dust and inhalation of organic particles (including pesticides).

81-0838. Hasegawa, H.; Sato, M.; Sudo, A.; Homma, K.; Miyakawa, M.; Suda, K.; Okonogi, K. (Natl. Inst. Ind. Health, Kawasaki, Kanagawa, Japan) **[Studies on methyl bromide intoxication.]** *Sangyo Igaku Sogo-Kenkyusho Nempo (Annu. Rep. Natl. Inst. Ind. Health)* pg. 16; 1980 (Japanese).

The toxic effects of methyl bromide were studied by exposing rats to air containing methyl bromide at concentrations of 1-120 ppm. Behavioral and biochemical methods were used to determine general symptoms and disturbances of the central nervous system, major organs and the blood of treated animals. Effects observed were compared to former results obtained for methyl iodide.

81-0839. Kawai, K.; Mitsueda, J.; Shimizu, S.; Hasegawa, H.; Sato, M. (Natl. Inst. Ind. Health, Kawasaki, Kanagawa, Japan) **[Pathological studies on the inhalation toxicology of 1,2-dibromo-3-chloropropane (DBCP).]** *Sangyo Igaku Sogo-Kenkyusho Nempo (Annu. Rep. Natl. Inst. Ind. Health):* p. 18; 1980 (Japanese).

Male rats were exposed to air containing 0.3, 1, 3, or 10 ppm DBCP (dibromochloropropane) for 2 wk. Animals exposed to the highest dose showed testicular atrophy; denaturation, necrosis and abnormal regeneration of the proximal kidney tubules and bronchial epithelium; emphysametous dilation of pulmonary parenchyma; and atrophy of splenic white pulp. The degree of testicular impairment was dose dependent; tissue impairment was observed at 1 ppm DBCP. Some testicular impairment showed no histological recovery. Two rats exposed to 10 ppm DBCP died after 1 yr; malignant kidney tumors were found.

81-0840. Borzelleca, J. F.; Egle, J. L., Jr.; Hennigar, G. R.; Klein, H. H.; Kuchar, E. J.; Lane, R. W.; Larson, P. S. (Dep. Pharmacol., Med. Coll. Virginia, Richmond, VA 23298) **A toxicologic evaluation of 5-ethoxy-3-trichloromethyl- 1,2,4-thiadiazole (ETMT).** *Toxicol. Appl. Pharmacol.* 56(2): 164-170; 1980 (6 references).

The following studies were conducted on 3-ethoxy-3-trichloromethyl- 1,2,4-thiadiazole (ETMT, Terrazole), a soil fungicide: acute oral toxicity in rats, rabbits, and dogs; acute and subchronic percutaneous toxicity in rabbits; subchronic feedings to rats and dogs; 2-yr feeding to rats and dogs; and a 3-generation reproduction study in rats. CD rats, albino rabbits, and mongrel and beagle dogs were employed. The acute oral toxicity values (LD50 ± SD) were: rats, 1077 ± 78 mg/kg; rabbits, 779 ± 532 mg/kg; dogs > 5000 mg/kg (premedicated with morphine). The test material was added to the diet of rats at levels of 0, 78, 156, 312, 625 and 1250 ppm (subchronic study) and 0, 10, 80 and 640 ppm (chronic study and reproductive study); and to the diet of dogs at levels of 0, 100, 400 and 1600 ppm (subchronic study); and 0, 10 100 and 1000 ppm (chronic study). Three-mo feeding in rats resulted only in growth inhibition at 1250 ppm and elevated liver-to-body wt ratios at 625 and 1250 ppm. Dogs fed 3 mo showed a decrease in spleen-to-body wt ratios at all feeding levels and a higher liver-to-body wt ratio at 1600 ppm. No consistent adverse dose-related effects were apparent in the 2-yr rat feeding study. The following findings were noted only in dogs that received the 1000 ppm diet: a lesser body wt gain, increases in SAP, SGOT, serum cholinesterase, BSP retention, liver wt; cholestatic hepatosis with secondary bile nephrosis. No adverse effects were apparent at 10 or 100 ppm. In the 3-generation reproduction study, no adverse effects were apparent on fertility, gestation, viability, lactation, number of stillborn, and mean number of pups born and weaned per litter. Adverse effects occurred only on the 640 ppm diet and these consisted of lower weaning wt of offspring and depressed body wt gains of parent rats. (Author abstract by permission)

81-0841. Roy(Shapira), A.; Taitelman, U.*; Bursztein, B. (Natl. Poison Inf. Cent., Rambam Med. Cent., Haifa, Israel) **Evaluation of the role of ionized calcium in sodium fluoroacetate (1080) poisoning.** *Toxicol. Appl. Pharmacol.* 56(2): 216-220; 1980 (17 references).

Fluoroacetate (sodium fluoroacetate), which is an inhibitor of the tricarboxilic acid cycle, is widely used as a rodenticide. Fluoroacetate is converted in the body to fluorocitrate, which is an inhibitor of the enzyme aconitate hydrase. As a result, energy production goes down, and citrate accumulates. As citrate is a potent chelator of calcium ion, we postulated that ionized calcium concentration in the blood would drop. Fluoroacetate, 0.03 mmol/kg, was injected iv into anesthetized cats. Ionized calcium concentration in anaerobically drawn arterial blood samples was measured with an ion-exchange electrode. Samples were taken immediately before and 40 min after the poisoning, after which the animals were either used as controls (6 cats) or treated with an infusion of iv $CaCl_2$ (another 6 cats), so as to restore ionized calcium levels to normal values. Forty min after fluoroacetate injection, the ionized calcium levels fell by an average of 27.2%, from 1.09 ± 0.07 to 0.79 ± 0.14 m*M*. There was a corresponding prolongation of the QTc interval of the ECG (r = 0.82). Treatment with $CaCl_2$ significantly prolonged the life of the treated animals as compared to the control animals ($p < 0.0016$ by the Mann-Whitney rank sum test). Our findings suggest that reduced levels of ionized calcium play an important role in the pathogenesis of fluoroacetate poisoning. The reduced levels of Ca^{2+} are an adequate explanation for the toxic effects of fluoroacetate, and may be the missing link between the biochemistry of the poisoning and the clinical manifestations. (Author abstract by permission)

81-0842. Foil, L. D.; Chambers, H. W.; Stinson, R. S.; Glick, B. (Dep. Entomol., Mississippi Agric. & For. Exp. Stn., Mississippi State Univ., Mississippi State, MS 39762) **Immunological aspects of tri-*o*-tolyl phosphate-induced delayed neurotoxicity in chickens.** *Toxicol. Appl. Pharmacol.* 56(2): 259-264; 1980 (26 references).

The immunological aspects of delayed neurotoxicity induced in chickens by tri-*o*-tolyl phosphate were investigated. The ataxic syndrome was not produced in control chickens by passive transfer of serum and/or lymphocytes from ataxic donors without subsequent TOTP treatment. The antibody response of ataxic birds for a T-cell dependent antigen (sheep red blood cells) and a T-cell independent antigen *(Brucella abortis)* was normal. Conversely, the T-cell-mediated graft *vs.* host and phytohemagglutin wattle responses were significantly depressed. Metabolites of TOTP and phenyl saligenin phosphate were cytotoxic to lymphocytes *in vitro*. The effects of TOTP appeared to be limited to a subpopulation of T cells, possibly via lymphocytotoxicity. (Author abstract by permission)

81-0843. Hemingway, J.; Akood, M.; Lines, J. D.; Curtis, C. F.; Davidson, G. (Ross Inst., London Sch. Hyg. Trop. Med., London WC1E 7HT, England) **Organophosphate and carbamate resistance and susceptibility in the adults and larvae of *Anopheles* species.** *Trans. R. Soc. Trop. Med. Hyg.* 74(5): 677-678; 1980 (2 references).

Studies on resistance to pesticides in *Anopheles* are described. Tests using malathion and temephos against *A. arabiensis* and *A. stephensis* were carried out using larvae of resistant and susceptible strains. It was found that the dose-mortality relationship for the larvae were very similar, indicating that the mechanism conferring resistance is operative only at the adult stage. It is concluded that adult resistance did not arise from selection by residues of agricultural insecticides in breeding places. Translocation of resistant genes in two strains indicated the same gene confers resistance to dieldrin in one organophosphate pesticides in the other strain.

81-0844. Haight, E. A.; Harvey, J. G., Jr.; Singer, A. W.; Pope, C. R. (Environ. Hyg. Agency, US Army, Aberdeen Proving Ground, MD) **Subchronic oral toxicity of the insect repellent *N,N*-dimethyl-m- toluamide (m-DET), Sept. 1978-May 1979.** *US NTIS AD Rep.* AD-A082,131/4: 27 pp.; 1980.

A subchronic oral evaluation of the technical grade compound *N,N*-diethyl-m-toluamide (m-DET, DEET) was conducted using rabbits. The high dose group, 528 mg/kg (0.33 LD50), showed a progressive decrease in body wt throughout the study. Serum calcium levels were decreased, and cholesterol and triglyceride levels were increased significantly for this same group. No other toxicity signs were observed during the 15-day treatment period. (Author abstract by permission)

81-0845. Munson, A. E. (Med. Coll. Virginia, Richmod, VA) **Development of short term immunotoxicological assays for the prediction of chronic toxicological responses induced by environmental chemicals.** *US NTIS PB Rep.* PB80-811,532: p. 16; 1980.

The overall goal of the research is to systematically develop a battery of *in vitro* physical, biochemical, and functional assays to predict subchronic or chronic toxicologic behavior that would be produced by *in vivo* exposure to a chemical. The general experimental plan utilizes both *in vivo* and *in vitro* approaches. Results of *in vivo* tests are used as a reference to see if the *in vitro* tests can predict toxicologic responses. *In vivo*, mice were exposed subchronically to the environmental chemical trichloroethylene (TCE-2), and specific studies were performed to assess bone marrow status, macrophage function, cell mediated immunity, humoral immunity, and standard toxicologic parameters. *In vitro*, a tier assay system is being developed, including 2 cytotoxicity tests, assessment of

DNA synthesis, phagocytosis, lymphocyte responsiveness to mitogens, enumeration of bone marrow stem cells, and an antibody-forming cell assay (the Mischell-Dutton assay). The LD50s for male and female mice exposed by the gastrointestinal tract to TCE-2 were 2402 and 2454 mg/kg, respectively. In a combination range-finding study of TCE-2 in the drinking water and 30-day interaction with emulphor (1%), there were only 4 parameters significantly different from the appropriate control, but none of these parameters showed dose dependency and could not be specifically attributed to an interaction between TCE-2 and emulphor. (Author abstract by permission)

81-0846. Dandliker, W. B.; Hicks, A. N.; Levison, S. A.; Stewart, K.; Brawn, R. J. (Scripps Clin. & Res. Found, La Jolla, CA) **Effects of pesticides on the immune response.** *US NTIS PB Rep.* PB80-811,532: p. 19; 1980.

The influence of various pesticides on the humoral and cellular immune response to fluorescein labeled ovalbumin has been analyzed. Pesticides [Aroclor 1260, dinoseb, parathion, pentachloronitrobenzene (PCNB; quintozene), piperonyl butoxide, mixed pyrethrins and resmethrin] were administered ig in corn oil in one dose (0.5 LD50) before primary immunization. Control groups included those treated with corn oil alone or immunosuppressed with methotrexate. Booster immunization and test bleedings were scheduled at weekly intervals thereafter. The cellular immune response was quantified by redness and swelling, histological examination and by differential temperature measurements of the foot pads after antigen challenge. The concentration, binding affinity and heterogeneity of the serum antibody were determined by fluorescein polarization measurements. Dinoseb and parathion depress both the humoral and cellular response. Methotrexate and pentachloronitrobenzene give a late stimulation, while resmethrin an early, sometimes very marked stimulation of the cellular response. Other pesticides showed little or no effect under the conditions tested. Effects on the humoral response were limited to changes in antibody concentration, the binding affinity being nearly constant in all instances. (Author abstract by permission)

81-0847. Goldstein, J. A.; Friesen, M.; Linder, R. E.; Hickman, P.; Hass, J. R. (Environ. Toxicol. Div., Health Effects Res. Lab., Research Triangle Park, NC) **Effects of pentachlorophenol on hepatic drug-metabolizing enzymes and porphyria related to contamination with chlorinated dibenzo-*p*-dioxins and dibenzofurans.** *US NTIS PB Rep.* PB80-811,532: p. 22; 1980.

The hepatic effects of technical and pure grade pentachlorophenol (PCP) were investigated in female rats fed 20, 100 and 500 ppm of each for 8 mo. Technical PCP was contaminated with 8 ppm hexa-, 520 ppm hepta-, and 1380 ppm octachlorodibenzodioxin; pure PCP contained 0.1 ppm of each of these contaminants. Technical PCP produced hepatic porphyria and increased hepatic aryl hydrocarbon hydroxylase activity, glucuronyl transferase activity, liver weight, cytochrome P-450 and microsomal heme, but not N-demethylase activity. The peak of the CO-difference spectrum of cytochrome P-450 was shifted to 448 nm, and there was a dramatic increase in the 455-430 ratios of the ethyl isocyanide difference spectrum. The enzyme changes were observed at 20 ppm of technical PCP. Porphyria occurred at 100 and 500 ppm. Pure PCP had no significant effect on aryl hydrocarbon hydroxylase activity, liver wt, cytochrome P-450, microsomal heme, the ethyl isocyanide difference spectrum or N-demethylase activity at any dose level, but did increase glucuronyl transferase at 500 ppm. In contrast, both pure and technical PCP decreased body wt gain comparably at 500 ppm. It is concluded that technical PCP produces a number of liver changes which cannot be attributed to PCP itself, but are consistent with the effects of biologically active chlorinated dibenzo-*p*-dioxins and dibenzofurans. (Author abstract by permission)

81-0848. Sigmon, C. F. (South Carolina Water Res. Inst., Clemson Univ., Clemson, SC) **Physiological effects of 2,4-D and 2,4,5-T on selected aquatic organisms.** *US NTIS PB Rep.* PB80-811,532: p. 74; 1980.

The sublethal effects of 2,4-D and 2,4,5-T (butoxyethanol esters) on several aquatic animals were examined. The herbicide did not significantly affect oxygen consumption in *Lepomis macrochirus* (bluegill) exposed to 3 ppm. Little herbicide was retained by fish which were exposed to 3 ppm of 2,4-D or 2,4,5-T for 8 days. *Daphnia pulex* exhibited greater oxygen consumption when exposed to 3 ppm of 2,4,5-T at 30°C. Oxygen consumption in control and treatment groups did not differ at lower temperatures or for 2,4-D exposure. Mortality, pupation, and emergence were examined for *Chironomus* sp. exposed to 1 or 3 ppm of 2,4-D or 2,4,5-T. Significantly greater mortality and lower percentage pupation were observed in groups exposed to 3 ppm 2,4,5-T at 30°C. (Author abstract by permission)

81-0849. NCI, Bethesda, MD **Bioassay of (2-chloroethyl) trimethylammonium chloride (CCC) for possible carcinogenicity.** *US NTIS PB Rep.* PB80-811,532: p. 76; 1980.

A bioassay of (2-chloroethyl)trimethylammonium chloride (chlormequat chloride; CCC) for possible carcinogenicity was conducted by administering the test chemical in feed to F344 rats and B6C3F1 mice. Groups of 50 rats of each sex were administered either 1500 or 3000 ppm of the compound for 108 wk, and 50 mice of each sex were administered 500 or 2000 ppm for 102 wk. Matched controls consisted of 20 untreated rats and 20 untreated mice of each sex. No tumors occurred in the rats or mice of

either sex at incidences that could be associated with administration of the test chemical. It is concluded that under the conditions of this bioassay, (2-chloroethyl) trimethylammonium chloride was not carcinogenic for F344 rats or B5C3F1 mice of either sex. (Author abstract by permission)

81-0850. Friedman, A. A.; Coburn, C. B. (Water Resour. Res. Cent., Tennessee Univ., Knoxville, TN) **Development of a rapid bioassay technique for screening pollutant effects on fish.** *US NTIS PB Rep.* PB80-811,532: p. 77; 1980.

A rapid and relatively inexpensive tissue respirometric method for assessing the toxic effect of some classes of pollutants, such as the pesticide malathion, on fish has been developed and tested. It appears that fish liver homogenate respirometry is comparable with the conventional fish bioassay for systemic toxicants other than those which primarily interfere with gas transfer mechanisms in the gill or are neuro-toxicants. The response patterns of liver respirometry were similar in different species of fish and at different temperatures. Liver homogenates frozen in Krebs-Ringer's phosphate had a viability over 6 mo when stored at −20°C. (Author abstract by permission)

81-0851. Pulatov, R. P.; Makhamatova, Ya.; Tolkacheva, T. I.; Zakirova, A. S. (N. A. Semahko Inst. Health Resorts Sci. & Phys. Ther., Tashkent, USSR) **Effektivnost' bal'neoterapii bol'nykh s khronicheskoi mikstintokikatsiei khlori fosfororganicheskimi pestitsidami. [Efficacy of balneotherapy in patients with chronic mixed intoxication with organochlorine and organophosphorus pesticides.]** *Vopr. Kurortol. Fizioter. Lech. Fiz. Kult.* 5: 54-56; 1980 (7 references) (Russian).

A survey was made of 104 patients with prolonged occupational exposure to organochlorine and organophosphorus pesticides (OCP and OPP). All patients had clinical manifestations of liver and gastrointestinal tract pathology. The efficacy of balneotherapy was evaluated. Treatment resulted in normalization of the electrolyte balance in the serum and the urinary excretion of sodium.

81-0852. Delaforge, M.; Levi, P.; Morizot, J. P. (Fac. Med., ERA 267, CNRS, F-21033 Dijon, France) **Biotransformation of allylbenzene analogues *in vivo* and *in vitro* through the epoxide-diol pathway.** *Xenobiotica* 10(10): 737-744; 1980 (19 references).

The epoxidation of allylbenzene, safrole, estragole, eugenol and eugenol methyl ether (methyl eugenol) was investigated in rats pretreated with these compounds and also *in vitro* using hepatic microsomal preparations and adult liver cell cultures. Dihydrodiols were detected in the urine and liver of rats pretreated with allylbenzene compounds. Similarly, incubation of allylbenzene epoxides with hepatic microsomal preparations and adult rat liver cultures gave rise to the formation of dihydrodiols. (Author abstract by permission)

81-0853. McManus, M. E.; Davies, D. S. (Dep. Clin. Pharmacol., Royal Postgrad. Med. Sch., London W12 OHS, England) **Paraquat-stimulated binding of dopa to liver and lung microsomal protein.** *Xenobiotica* 10(10): 745-752; 1980 (25 references).

^{3}H-Dopa is converted by lung and liver microsomes to a reactive intermediate which binds covalently to lung and liver microsomal protein. Binding of radioactivity from ^{3}H-dopa to lung and liver microsomes was decreased by superoxide dismutase to the level observed with boiled microsomes. Paraquat (5 m*M*) caused a 133% increase in binding of radioactivity from ^{3}H-dopa with lung microsomes compared to a 224% increase with liver microsomes. However, superoxide dismutase decreased the binding by 38% and 50% with lung and liver microsomes, respectively. Benzoate and 1,4-diazobicyclo[2,2,2]octane in the absence and presence of paraquat had no effect on the binding of radioactivity from ^{3}H-dopa. Glutathione and ascorbic acid in the absence and presence of paraquat decreased the binding to below the level obtained with boiled microsomes. The soluble fraction when present in the physiological ratio to microsomal protein decreased the binding, in the presence of paraquat, to the level of the control. (Author abstract by permission)

81-0854. Pipy, B.; Gaillard, D.; Beraud, M.; Derache, R. (Groupe Rech. Toxicol. Aliments & Boissons, Inst. Physiol., U-87, INSERM, F-31400 Toulouse, France) **Phagocytic activity of the rat reticuloendothelial system and the pharmacokinetics of an anticholinesterasic insecticide: carbaryl.** *Xenobiotica* 10(10): 785-793; 1980 (26 references).

The pharmacokinetics of [^{14}C]carbaryl administered iv and po were studied in male rats whose reticuloendothelial system (RES) was inhibited by colloidal carbon or activated by glyceryl trioleate. A time course for [^{14}C]carbaryl blood concentration was fitted to a 2-compartment open model following single iv administration. A single exponential decay was noted following ig administration. The constant blood elimination of [^{14}C]carbaryl decreased significantly in animals with RES inhibited and increased in those whose RES was activated compared to control animals. There was an increase in carbaryl concentration in the tissue compartment in animals with the RES activated, but no change in animals with the

RES inhibited. The equivalent [^{14}C]carbaryl concentration of liver and lungs were decreased or increased in animals with the RES inhibited or activated, respectively. (Author abstract by permission)

See also 81-0601, 81-0603, 81-0606, 81-0607, 81-0608, 81-0809, 81-0610, 81-0611, 81-0613, 81-0618, 81-0619, 81-0627, 81-0628, 81-0630, 81-0631, 81-0632, 81-0634, 81-0638, 81-0639, 81-0641, 81-0642, 81-0644, 81-0645, 81-0659, 81-0666, 81-0672, 81-0683, 81-0690, 81-0691, 81-0698, 81-0702, 81-0703, 81-0706, 81-0707, 81-0711, 81-0712, 81-0726, 81-0728, 81-0739 *and* 81-0887.

81-0855. Harvey, J., Jr. (E.I. Du Pont de Nemours and Co. Inc., Biochem. Dep., Exp. Stn., Wilmington, DE 19898) **Modern high-performance liquid chromatography in pesticide metabolism studies.** *ACS Symp. Ser.* 136(CH01): 1-14; 1980 (7 references).

A working radiochromatograph for pesticide research is described, and some of the problems associated with the use of this type of instrument are considered. Flow cells for use with the radiochromatograph are considered, including both scintillation flow cells for aqueous systems and for organic solvents. Examples are given of the identification of a compound from river water samples, and from samples of goat milk. The technique is also useful for situations in which the ^{14}C from a labeled pesticide has been incorporated into normal natural products such as amino acids.

81-0856. Burns, D. A. (Technicon Ind. Syst., Tarrytown, NY 10591) **FAST-LC concepts for automated pesticide analysis.** *ACS Symp. Ser.* 136(CH02): 15-30; 1980 (19 references).

Fully automated sample treatment for liquid chromatography (FAST-LC) applications for the field of pesticide residue analysis are considered. Manners in which both liquids and solids can be handled for analysis by this method are discussed. Various automated systems are described. In one system carbamates are determined by measuring inhibition of the enzyme cholinesterase. When no pesticide is present in the sample, the enzyme decomposed its substrate into a product which reacted with an indicator to give a detectable color change. With pesticide present, however, the enzymatic reaction was inhibited and recorder tracings were lowered. Examples of other methods of analysis involving either pre-column or post column treatment are also given. A system which can perform a fully automated analysis of a water-soluble herbicide is described. Fully-automated analysis for 2,4-D is also presented.

81-0857. Kissinger, P. T.; Bratin, K.; King, W. P.; Rice, J. R. (Dep. Chem., Purdue Univ., West Lafayette, IN 47904) **Electrochemical detection of picomole amounts of oxidizable and reducible residues separated by liquid chromatography.** *ACS Symp. Ser.* 136(CH05): 57-88; 1980 (78 references).

Liquid chromatography with electrochemical detection (LCEC) is described with emphasis on its usefulness for determining additives and residues of agricultural chemicals. Analysis of phenolic residues, aromatic amine residues, and electroreducible residues is discussed. Electroreducible compounds include nitroaniline herbicides, bipyridylium herbicides, parathion, dithiocarbamate fungicides, rodenticide residues and azomethine insecticides in grain formulations.

81-0858. Moye, H. A.; St. John, P. A. (Pestic. Res. Lab., Food Sci. & Hum. Nutr. Dep., Univ. Florida, Gainesville, FL 32611) **A critical comparison of pre-column and post-column fluorogenic labeling for the HPLC analysis of pesticide residues.** *ACS Symp. Ser.* 136(CH06): 89-102; 1980 (17 references).

A procedure is described for the fluorogenic labeling of pesticide residues for HPLC analysis that takes full advantage of the water solubility of the 2 analytes, their anionic and cationic behavior, the speed of HPLC separations and its suitability for the analysis of non-volatile compounds. The labeling approach used was sufficiently sensitive (0.1 ppm), reproducible, economical and relatively rapid. Two fluorogenic reagents were chosen that had demonstrated high quantum yields and were capable of producing high sensitivities for standards. A pre-column fluorogenic labeling reagent was chosen which derivatized both primary and secondary amines. The quaternary ammonium plastic bead column packings were found to be rugged and less prone to being fouled by other chemicals in the crop extracts than silica particle columns.

81-0859. Argauer, R. J. (Anal. Chem. Lab., Agric. Environ. Qual. Inst., Agric. Res., SEA, USDA, Beltsville, MD 20705) **Fluorescence and ultraviolet absorbance of pesticides and naturally occurring chemicals in agricultural products after HPLC separation on a bonded-CN polar phase.** *ACS Symp. Ser.* 136(CH07): 103-126; 1980 (3 references).

The usefulness of fluorescence during HPLC to detect pesticides is considered. Many pesticides fluoresce sufficiently when excited at 254 nm to permit the advantageous use of the intense 253.7 nm emission from a mercury light source for excitation in a HPLC fluorescence monitor. A fluorescence monitor can be used to support data obtained from an absorbance detector. However, the stereochemical nature of the pesticide itself, and the co-extracted coelutants found in the agricultural product, will determine the feasibility of a comparison of the relative sensitivity-selectivity of the absorbance mode *vs.* the fluorescence mode. The choice of mobile phase can influence the chromatographic peak areas in the fluorescence mode. The fluorescence intensities of 28 fungicides, herbicides and insecticides in hexane and methanol were measured at excitation wavelengths of both 254 nm and maximum absorbance. Samples studied included rice, corn, green pea, potato, cucumber, lima beans and orange. Pollen was the most challenging of the products studied due to the highly complex chromatograms obtained for methylene chloride extracts.

81-0860. Mallet, V. N. (Chem. Dep., Univ. Moncton, Moncton, New Brunswich E1A 3E9, Canada) **Quantitative thin-layer chromatography of pesticides by *in situ***

fluorometry. *ACS Symp. Ser.* 136(CH08): 127-157; 1980 (54 references).

Early developments in the field of quantitative TLC are reviewed in terms of the fluorometric detection methods that were developed for pesticide evaluation. Topics discussed include the theory of fluorescence, instrumentation for measuring fluorescence on thin-layer chromatograms (Turner fluorometer Model III, the Camag-Turner flourometer, and the Farrand VIS-UV chromatogram analyzer), the fluorescence of pesticides on thin-layer chromatograms, and methods for handling residue analysis. Pesticides which contain natural fluorescence include benomyl, coumatetralyl, diphacinone, fuberidazole, propyl isome and quinomethionate. Studying the fluorescence of pesticides by both direct and indirect methods is considered.

81-0861. Hauck, H. E.; Amadori, E. (E. Merck, D-6100 Darmstadt, BRD) **Recent developments in high-performance thin-layer chromatography and application to pesticide analysis.** *ACS Symp. Ser.* 136(CH09): 159-176; 1980 (20 references).

High-performance thin-layer chromatography (HPTLC) pre-coated layers are examined. Particular attention is given to silica gel 60, RP, cellulose and silica gel 60 with concentrating zone. These new or modified pre-coated layers offer new potential for pesticide analysis by thin-layer chromatography. Separations of BHC isomers, of bromophos-ethyl and dimethoate, and of the active constitutents of Trevespan 6038 [ioxynil, flurenol (fluorecol-butyl) and MCPA] were performed to provide a qualitative and quantitative comparison between TLC and HPTLC pre-coated plates, or between HPTLC plates coated with various sorbents, and to demonstrate their usefulness in pesticide chemistry.

81-0862. Seiber, J. N.; Ferreira, G. A.; Hermann, B.; Woodrow, J. E. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Analysis of pesticidal residues in the air near agricultural treatment sites.** *ACS Symp. Ser.* 136(CH10): 177-208; 1980 (82 references).

Considerable amounts of pesticides become airborne during and after spraying operations. Various methods for analyzing the quantities of pesticides in the air are considered. Methods are presented which are useful for both particulate and vapor analysis. It is suggested that the macroreticular resins including XAD-2, XAD-4, and Chromosorb 102 or porous polyurethane foam can be used as alternatives to the glycol impinger for sampling many common pesticides and related chemicals in the air. Parameters such as sampling efficiency, background, and analyte stability must be evaluated before a final choice can be made. Field applications for the analysis of DDT, DDD (TDE), DDE, endrin, dieldrin, heptachlor, toxaphene, carbofuran, parathion and merphos are considered.

81-0863. Getz, M. E.; Hill, K. R. (Anal. Chem. Lab., Agric. Environ. Qual. Inst., Agric. Res., SEA, USDA, Beltsville MD 20705) **New technology for pesticide residue cleanup procedures.** *ACS Symp. Ser.* 136(CH11): 209-229; 1980 (12 references).

The use of new technology for the clean-up of pesticide residue samples is discussed. Specific attention is given to microcolumn cleanup, continuous flow cleanup, application of macroporous silica gels, and fortification studies. In the fortification studies offered, the following matrices were fortified for the evaluation of Fractosil 200: tomatoes, carrots, green apples, animal fat, milk and greenhouse soil. Endosulfans A, B and the sulfate were quantitatively recovered at concentration levels of 0.2 and 2.0 ppm.

81-0864. Cochrane, W. P. (Lab. Serv. Div., Agric. Canada, Ottawa, Ontario K1A OC5, Canada) **Chemical derivatization techniques in pesticide analysis. Advances and applications.** *ACS Symp. Ser.* 136(CH12): 231-249; 1980 (56 references).

The use of chemical derivatization techniques has increased significantly in the analytical procedures devoted to the detection of carbamate and herbicide residues. This review highlights recent advances in derivatization procedures or techniques as illustrated with applications from the 4 main groups of pesticides, (herbicides, organochlorine and organophosphorus insecticides, and fungicides). Derivatives of the herbicides 2,4-D, 2,4-DB, 2,4-DP, (dichlorprop), 2,4,5-T, 2,4,5-TB, 2,4,5-TP (silvex), MCPA, MCPB, MCPP (mecoprop), 2,4,6-TBA, picloram, dicamba and fenac have been used. Also included in this review are derivatives formed of Kepone (chlordecone), mirex, DDE, MCB, methidathion, pentachlorophenol (PCP) and carbamates.

81-0865. Tewari, S. N. (State Forensic Sci. Lab., Utter Pradesh Lucknow, India) **Distribution of pesticides in human organs as determined by quantitative thin-layer chromatography.** *ACS Symp. Ser.* 136(CH14): 259-276; 1980 (84 references).

The widespread use of pesticides has resulted in cases of human death due to pesticide exposure. The suspected chemical is seldom spread evenly throughout the victim's body, and detection of the chemical in the body is essential to confirm the death as pesticide-related. Qualitative and quantitative analyses must be carried out of various tissue samples to determine the cause of death. Quantitative TLC using densitometry for the determination of traces of pesticides is described in detail, with attention given to both organophosphorus and organochlorine insecticides. Preparation of thin layer plates, storage, application of samples, development of the plate, solvent systems to be used, the location of the spots and Rf values are all considered. Solvent systems are detailed for

organophosphorus, organochlorine and carbamate pesticides. Actual distributions of pesticides in tissues and fluids analyzed in cases of human poisonings are listed.

81-0866. Secrest, W. L.; Fischer, W. C.; Ryskiewich, D. P.; Cassidy, J. E.; Marco, G. J. (Agric. Div., Ciba-Geigy Corp., Greensboro, NC 27409) **Reduction of radioactive metabolic data using a desk-top computer network.** *ACS Symp. Ser.* 136(CH16): 287-298; 1980 (1 reference).

The use of a Hewlett-Packard 9800-series computer network, linked by direct interfacing to liquid scintillation counters, has been used to simplify and reduce data collected from pesticide metabolism studies. Laboratory personnel have found the system useful for scientific data collection, reduction, retrieval and reporting. Computer results can be obtained within minutes if necessary. Experimental design is not dictated by computer availability. However, the computer link allows better summarization and interpretation of results. The use of such a system decreases the time required to obtain accurate scientific data for the registration of new pesticides with the EPA.

81-0867. Lowry, S. R.; Gray, C. L. (Diamond Shamrock Corp., Painesville, OH 44077) **Some applications of Fourier transform infrared spectroscopy to pesticide analysis.** *ACS Symp. Ser.* 136(CH17): 299-320; 1980 (7 references).

The usefulness of Fourier transform infrared spectroscopy (FTIR) to the analytical chemist for pesticide analysis is reviewed. Information is presented on the structure of the Michelson interferometer, the appearance of an interferogram and the resulting single beam spectrum after Fourier transformation, and the normal IR spectrum plotted in transmittance and absorbance. An example of the system using thiofanox as an analytical sample is described. Microsampling and impurity studies are also reviewed. Specific areas where FTIR has provided help in analytical work have included the identification of impurities in technical material, the analysis of volatile components from formulated material, and the identification of metabolites.

81-0868. Hammock, B. D.; Mumma, R. O. (Div. Toxicol. Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Potential of immunochemical technology for pesticide analysis.** *ACS Symp. Ser.* 136(CH18): 321-352; 1980 (83 references).

The potential of several immunochemical techniques for residue analysis are explored. Background methodology is presented to a limited degree. Specific topics of discussion include the methodology of antibody formation including hapten synthesis, hapten coupling, antigen purification and characterization, choice of animal for antibody production, immunization procedures, antibody characterization, competitive binding, bound/free separations, optimization of the assay, choice of radioligand, and the enzyme-linked immunosorbent assay. Other immunoassay methods are considered along with monoclonal antibody technology. Attributes and limitations of immunoassay are considered including immunoassay sensitivity, specificity, speed of analysis, cost effectiveness, applicability, problems with immunoassays, and the possible contribution of immunochemical methods to pesticide analysis.

81-0869. Horning, E. C.; Carroll, D. I.; Dzidic, I.; Stillwell, R. N. (Inst. Lipid Res., Baylor Coll. Med., Houston, TX 77030) **Negative ion mass spectrometry.** *ACS Symp. Ser.* 136(CH19): 353-366; 1980 (14 references).

Negative ion mass spectrometry (NIMS) is expected to be useful in pesticide work and toxicological studies. However, the method is not yet widely used as an analytical method. Most analysis is generally positive ion mass spectrometry with CI or EI. The chief delay has been the relatively high cost of mass spectrometric methods. Continued improvements in gas chromatography have resulted in increased use of NIMS. Relatively high error rates in identification and quantification by electron capture detection suggest that all definitive procedures should be based on mass spectrometry. Validation by chromatography and chromatography detection should include mass spectrometric evidence rather than chromatographic evidence alone. Data are reviewed on benzil, methyl parathion, tetradifon and 2,3-dibromopropanol.

81-0870. Stewart, T. E.; Cannizzaro, R. D. (Thompson-Hayward Chem. Co., Kansas City, KS 66106) **Analysis of organotin pesticide residues by gas chromatography/mass spectrometry.** *ACS Symp. Ser.* 136(CH20): 367-388; 1980 (15 references).

The usefulness of GC/MS methodology for the determination of triphenyltin hydroxide (TPTH) residues in crops is discussed. The method relies on the gas chromatography of the methyl derivative and quantification by mass spectrometry set to monitor characteristic ions of the compound. Prior to extraction the samples are ground or chopped, vacuum filtered and then extraction is performed. The extract is then eluted on a Florisil column clean-up procedure. The cleaned-up residue is dissolved, and TPTH is converted to triphenyltin chloride (TPTCl), which is further converted to triphenylmethyltin (TPTM). Alumina column clean-up and GC/MS analysis complete the procedure. Other applications of the method include analysis of trichlorohexyltin hydroxide (cyhexatin) and Vendex (fenbulatin oxide). This method provides greater specificity than others currently used for the analysis of TPTH in crops.

81-0871. Gluck, S. J.; Melcher, R. G. (Anal. Lab., Dow Chem. USA, Midland, MI 48640) **Concentration and determination of the propylene glycol butyl ether esters of 2,4-dichlorophenoxyacetic acid (PGBE 2,4-D) in air.** *Am. Ind. Hyg. Assoc. J.* 41(12): 932-934; 1980 (5 references).

A method has been developed and validated for the determination of airborne propylene glycol butyl ether ester and the dipropylene glycol butyl ether ester of 2,4-dichlorophenoxyacetic acid. The method is designed to collect samples in the breathing zone of workers for 4 hr at 150 ml/min using a tube containing 750 mg of Amberlite XAD-2 resin and a portable pump. Recoveries of 85.2% and 81.4% were obtained for the two esters over a range of 0.67 to 13.3 mg/m³ by desorption with hexane. The extracts were analyzed by electron capture gas chromatography using a highly efficient and inert bonded Carbowax 20-M column packing. The recovery was not affected by 80% relative humidity or refrigerated storage for 2 wk. Some loss in recovery was observed for the 0.67 mg/m³ level when samples were stored at room temperature for 2 wk. The overall precision of the method for the two esters is ± 17% and ± 16% at the 95% confidence level. (Author abstract by permission)

81-0872. Clegg, D. E.; Dobinson, A. (Sch. Sci., Griffith Univ. Nathan 4111, Australia) **Confirmation of residue identity: characterization of products of the reaction between chromium (II) solutions and aldrin.** *Bull. Environ. Contam. Toxicol.* 25(5): 733-737; 1980 (5 references).

Studies were performed that demonstrated an aldrin confirmation technique by which aldrin is reacted with chromium (II). When the reaction is carried out in dimethylformamide (DMF), three principle products are formed, all of which have shorter retention times than aldrin when the reaction mixture is analyzed by gas chromatography. Analyses of the extracts (hexane extraction followed by NaCl-hexane clean-up) is reported to be a more positive confirmation than the injection of the original aldrin extract into several columns of different polarity.

81-0873. Giam, C. S.; Trujillo, D. A.; Kira, S.; Hrung, Y. (Dep. Chem., Texas A&M Univ., College Station, TX 77843) **Simplified monitoring procedures for benzo(a)pyrene, hexachlorobenzene and pentachlorophenol in water.** *Bull. Environ. Contam. Toxicol.* 25(5): 824-827; 1980 (4 references).

A method is described by which 5.0 ml volumes of water can be analyzed for benzo(a)pyrene (BaP), hexachlorobenzene (HCB) and PCP. Water samples were double extracted with 1.0 ml petroleum ether, partially evaporated, filtered, and dissolved in MeOH and analyzed for BaP by high pressure liquid chromatography (HPLC). For HCB, the samples were extracted once with isooctane and the extract analyzed by gas chromatography with electron capture detection. PCP was analyzed by HPLC after the samples were acidified with 2-3 drops 6 N H_2SO_4 then double extracted with petroleum ether:diethyl ether (1:1), evaporated, and redissolved in CH_4CN. Recoveries with this method (which requires smaller sample and less time) were better in most cases than recoveries using other methods; however, the detection limits were not as sensitive. Detection limits obtained for the short and long methods, respectively, were 0.04 and 0.001 ppb BaP, 0.10 and 0.005 ppb HCB, and 40 and 0.2 ppb PCP.

81-0874. Kojima, M.; Sekigawa, N.; Shiga, N.; Matano, O.; Goto, S. (Inst. Environ. Toxicol., Tokyo, Japan) **Residue analysis of dithianon by high pressure liquid chromatography with post-column colorimetric derivatization.** *Bunseki Kagaku (Jpn. Anal. Chem.)* 29(11): 738-743; 1980 (12 references).

A method was described for the determination of dithianon. The method is based on on-line post-column reaction with sodium sulfide. Residue analysis for dithianon was carried out on 11 crops. Sodium sulfide solution is added continuously to the column effluent and then reacted with the dithianon. The colored product which is formed is detected photometrically at 375 nm. The minimum amount detectable was 20 ng. Dithianon is extracted from the crops using acetone. For a 50 g sample, detection limits were 0.01 ppm. Recoveries from crops fortified at the 0.2 ppm level were 80% to 106%. The method requires only a short time and is applicable for routine high pressure liquid chromatographic analyses.

81-0875. Kofman, I. Sh. (Inst. Plant Physiol., Kiev, USSR) **Gazokhromatograficheskoe oprenolelenie simazina, atrazina i prometrina pri sovmestnom prisutststvii v kul'turnykh rasteniyakh. [Gas-chromatographic determination of simazine, atrazine and prometryne with their joint presence in cultivated plants.]** *Fiziol. Biokhim. Kul't. Rast.* 12(2): 198-201; 1980 (4 references) (Russian).

A method of simultaneous determination of *sym*-triazine herbicides simazine, atrazine and prometryne in plant samples is described. The method is based upon extraction of prometryne and atrazine with hexane and simazine with chloroform; then subsequent gas chromatographic separation in two columns with stationary liquid phases of different polarity. The best separation was achieved in a hexane: acetone: 1 N sodium hydroxide (1:1:1). Coefficients of distribution of simazine, atrazine and prometryne in this system were 0.07, 5.2 and 11.0, respectively.

81-0876. Pilenkova, I. I.; Zemchenkova, G. K.; Degteva, A. I.; Yurkova, R. G. (Inst. Chem. Means Plant

Protect., Ufa, USSR) **Metody kontrolya za sodershaniem vrednykh veshchestv v vozdukhe rabochei zony proizvodstva amibena. [Control of the level of toxic compounds in the air of working zone of Amiben production.]** *Gig. Tr. Prof. Zabol.* (10): 50-51; 1980 (2 references) (Russian).

Methods for determination of toxic by-products of the herbicide Amiben (chloramben) in the air of the working zone are described. The compounds were divided into 3 groups. Group 1 included hexa- and octachloroparaxylols, group 2 consisted of dimethyl esters of 2,5-dichloro-3-nitro-,2,5-dichloro-3-aminophthalic acid and Amiben, and group 3 included dimethyl ester of 2,5-dichloroterephthalic acid. Compounds from groups 1 and 2 were determined by thin-layer chromatography, while compounds from group 3 were determined by gas-liquid chromatography. The reproducibility of the methods developed was tested by introduction of test compounds into the absorbent at 3 given levels with subsequent extraction and quantitative determination.

81-0877. Eiceman, G. A.; Karasek, F. W. (Guelph-Waterloo Cent. Grad. Work Chem., Dep. Chem., Univ. Waterloo, Waterloo, Ontario N2L 3Gl, Canada) **Retention behavior of chlorinated benzenes, chlorinated phenols, aldrin, and aroclor 1242 on Tenax-GC, Chromosorb 101, Florisil, and Carbopack C HT.** *J. Chromatogr.* 200: 115-124; 1980 (20 references).

Four sorbent materials, Tenax-GC, Chromosorb 101, Florisil, and Carbopack C HT were characterized using elution analysis by gas chromatography for chlorinated benzenes, chlorinated phenols, aldrin and Aroclor 1242. Plots of log V_n *vs.* $°K^{-1}$ were linear with correlation coefficients of 0.992-1.000. Chlorinated phenols, aldrin and Aroclor 1242 were not eluted on a Florisil column at temperatures as high at 325-375°C. Specific retention volumes, which were calculated for 20°C using results from linear regression analysis, generally followed the order: Tenax-GC > Chromosorb 101 > Carbopack C HT. At 250°C, measured specific retention volumes generally followed the order: Chromosorb 101 > Carbopack C HT > Tenax-GC. These results show that analytical procedures based on thermal desorption techniques may be developed for the determination of these chlorinated organic compounds. Tenax-GC is the best sorbent material based on retention properties. (Author abstract by permission)

81-0878. Onodera, S.; Tabata, M.; Suzuki, S.; Ishikura, S. (Fac. Pharm. Sci., Tokyo Univ. Sci., Shinjuku-ku, Tokyo 162, Japan) **Gas chromatographic identification and determination of chlorinated quinones formed during chlorination of dihydric phenols with hypochlorite in dilute aqueous solution.** *J. Chromatogr.* 200: 137-144; 1980 (31 references).

This paper describes gas chromatographic identification of chlorinated quinones present in water on the basis of plots of log t_R against number of chlorine atoms in the molecule. The plots for each homologous series of chlorinated phenols, hydroquinones (HQ) and *p*-benzoquinones chromatographed on polar and nonpolar columns are found to be linear, with few exceptions. Mono-, di- and trichlorinated quinones are the principal intermediate products during chlorinations of catechol, resorcinol, HQ and methyl-HQ with aqueous hypochlorite. The residual intermediate compounds formed from resorcinol and methyl-HQ are present in higher concentrations in chlorinated water than those of other dihydric phenols. (Author abstract by permission)

81-0879. Szeto, S. Y.; Sundaram, K. M. S. (For. Pest Manage. Inst., Canadian For. Serv., Environ. Canada, Sault Ste. Marie, Ontario P6A 5M7, Canada) **Simplified method for the analysis of some carbamate insecticides in foliage, forest soil and fish tissue by direct gas-liquid chromatography.** *J. Chromatogr.* 200: 179-184; 1980 (14 references).

A simplified and sensitive method for the analysis of 8 carbamate insecticide residues in foliage, forest soil and fish tissue by direct gas-liquid chromatography (GLC) is described. After fortification, the carbamate residues were extracted from the natural substrates by homogenization in ethyl acetate. The interfering co-extractives present in the crude extracts were removed by filtration through Whatman GF-A glass microfibre filters after coagulation. The carbamate residues were re-extracted into dichloromethane and directly analyzed intact by GLC with a Tracor Model 702 nitrogen-phosphorus detector. The rate of recovery for aminocarb, carbofuran, carbaryl, methomyl, mexacarbate, pirimicarb and propoxur was better than 80% at 5.0 ppm and 0.50 ppm levels. Slightly less than 60% was recovered for methiocarb. (Author abstract by permission)

81-0880. Dumas, T. (Res. Inst., Agric. Canada, London, Ontario N6A 5B7, Canada) **Determination of formaldehyde, acetaldehyde and associated components in solution and in vapors by gas chromatography.** *J. Chromatogr.* 200: 206-210; 1980 (6 references).

A modified gas chromatographic method of analysis coupled with simple practical trapping methods for field use at ambient temperature were investigated for the determination of acetaldehyde during fumigation treatments. For acetaldehyde analysis only one peak was found when either the solution or saturated vapor in air was injected. Retention time was 8.4 min. Up to 50 ml of acetaldehyde-air mixture could be trapped and analyzed using a Tenax GC collecting tube.

81-0881. Abidi, S. L. (Natl. Fish. Res. Lab., US Fish & Wildl. Serv., La Crosse, WI 54601) **Gas-liquid**

chromatography of straight chain homologs of alkylbenzyldimethylammonium compounds. *J. Chromatogr.* 200: 216-220; 1980 (10 references).

New methods of chemical derivatization that convert non-volatile alkylbenzyldimethylammonium chloride homologs (widely used as fungicides, algicides and bactericides) into more volatile substances amenable to GC with enhanced detectability are described. A two-step derivatization procedure is presented which provides versatile methods for detection and separation and also facilitates the detection of quaternary ammonium compounds at the pg level by GC methods. The first step calls for the formation of trichloroethyl carbamate derivatives. The residue obtained in this step is then dissolved in chloroform, added to cyanogen bromide and allowed to produce cyanamide derivatives.

81-0882. Levesque, D.; Mallet, V. N. (Chem. Dep., Univ. Moncton, Moncton, New Brunswick E1A 3E9, Canada) **Gas-liquid chromatographic analysis of aminocarb and seven derivatives.** *J. Chromatogr.* 200: 228-233; 1980 (11 references).

The use of GLC for analysis of aminocarb and 7 possible degradation products without derivatization was investigated. The 7 derivatives studied included matacil phenol, methyl formylamino matacil, formylamino matacil phenol, methylamino matacil, formylamino matacil, amino matacil, and amino matacil phenol. The limiting factor in analysis was thermal degradation. It was not possible to separate a mixture of aminocarb and its derivatives under isothermal conditions. Temperature programming allowed good separation of the components. In attempting to recover aminocarb and its degradation products from water, the use of XAD resins enabled the chemicals to be recovered quantitatively. A recovery of ~ 90% was possible using either XAD-2 or XAD-4 at 0.1 ppb. Attempts to recover the degradation products were less successful. Development of a multi-residue extraction technique for aminocarb derivatives using XAD-resins is in progress.

81-0883. Lokke, H. (Lab. Environ. Sci. & Ecol., Techn. Univ. Denmark, DK-2800 Lyngby, Denmark) **Determination of amitrole by ion-pair high-performance liquid chromatography.** *J. Chromatogr.* 200: 234-237; 1980 (5 references).

A method for the analysis of amitrole based on a combination of the Storherr and Burke procedure for extraction and clean-up is described. Optimum H-acid coupling is followed by chromatographic clean-up on polyamide and ion-paired HPLC. The polyamide clean-up was a modification of a method for the determination of synthetic acid food coloring matters. Samples of potatoes and fodder beets were extracted with ethanol, then adsorbed on resin, and followed by the acetonitrile and acid digestion clean-up. The detection limit was 0.005-0.01 mg/kg in potatoes or fodder beets.

81-0884. Speck, M.; Dirr, E. (Inst. Biol. Forsch., D-5000 Cologne 90, BRD) **Gas chromatographic determination of metalaxyl (Ridomil) residues in tobacco.** *J. Chromatogr.* 200: 313-316; 1980 (5 references).

A method for the determination of metalaxyl residues in tobacco is presented based on gas-liquid chromatography. The method can also be applied to other plant materials. The retention time for metalaxyl was 2.5 min under the conditions of this study. Dried cut tobacco was powdered, and centrifuged after the addition of methanol. The extract was evaporated to dryness and then dissolved in sulfuric acid. The solution was transferred to a centrifuge tube, and, after centrifugation, was injected into the gas chromatograph. The method could detect metalaxyl residues of < 0.1 mg/kg in tobacco.

81-0885. Singh, U. S.; Tripathi, R. K. (Dep. Plant Pathol., G. B. Pant Univ. Agric. & Technol., Pantnagar, Nainital 263145, India) **Estimation of the systemic fungicide Ridomil by thin-layer chromatography.** *J. Chromatogr.* 200: 317-323; 1980 (4 references).

A simple TLC system and chromatographic reagents able to detect very low levels of Ridomil (metalaxyl) are described. Simple regression equations for estimating the quantity of Ridomil are presented. This method has been used to successfully analyze Ridomil from treated maize and pearl millet plants. Thirty g of maize were soaked for 24 hr at room temperature in a suspension of 37.5 mg AI fungicide. The seeds were germinated for 7 days. Analysis was made of fungicide content on seeds, roots and shoots. For foliage treatment studies, 2-mo-old maize plants were sprayed with 500 ppm AI of an aqueous suspension. Ridomil was extracted from leaves using acetone.

81-0886. Thomas, Q. V.; Stork, J. R.; Lammert, S. L. (Finnigan Inst., Cincinnati, OH 45246) **The chromatographic and GC/MS analysis of organic priority pollutants in water.** *J. Chromatogr. Sci.* 18(11): 583-593; 1980 (6 references).

Of the US EPA's list of pollutants to be controlled under a Consent Decree court ruling, 129 compounds and metals were designated priority pollutants based on their frequency of occurrence in point source industrial samplings. Methodology for the GC/MS and chromatographic analysis for 114 of these priority pollutants in wastewater is reviewed. Sections on sampling, storage, equipment, sample preparation and quality control are included. Under the Best Available Technology section of the Consent Decree, a liquid-liquid concentration method is recommended for

TCDD followed by GC/MS. Gas chromatographic methods using purge-and-trap concentration are applied to purgeable halocarbons and aromatics, and acrolein and acrylonitrile. Phenols, phthalate esters, nitrosamines, many organochlorine pesticides, PCBs, nitroaromatics, polynuclear aromatic hydrocarbons (PAH) and haloethers are best analyzed by gas chromatographic methods using liquid-liquid extraction. Liquid chromatography with liquid-liquid extraction is utilized for benzidine and its derivatives, and PAHs. GC/MS methodology is also used in conjunction with liquid-liquid extraction at very acidic or basic pH levels for a number of phenolic compounds and pesticides, and with purge trap concentration techniques for many of the purgeable organics. The legal aspects of the proposed analysis methods for the priority pollutants are discussed in relation to the National Pollutant Discharge Elimination System permits.

81-0887. Shafik, T. M. (Dep. Plant Prot., Coll. Agric., Alexandria Univ., Alexandria, Egypt) **Analytical approaches for determining human exposure to pesticides.** *J. Environ. Sci. Health B* 15(6): 1023-1058; 1980 (52 references).

Both persistent and biodegradable pesticides in the environment pose a potential hazard to human health. An index for calculation of the biodegradability of a given pesticide based on correlation of its fat solubility and environmental persistence is presented. The halogenated pesticides are the most fat soluble and generally most resistant to biodegradation. The methylated water soluble compounds are the most biodegradable of the pesticides. Three gas-liquid chromatography techniques (Macro, Micro Florisil, and Micro Silica) for detection of low concentrations of halogenated pesticides in samples of adipose tissue are described. These compounds may also be detected in blood by an electron capture gas chromatographic method. Nonpersistent organophosphorus and carbamate insecticides may be detected and monitored in humans by examining levels of acetylcholinesterase inhibition and urinary metabolites. Methods of monitoring human exposure to phenols, phenoxy acids, anilines and alkyl phosphates are also presented.

81-0888. Enos, H. F. (Dep. Epidemiol. & Public Health, Sch. Med., Univ. Miami, Miami, FL) **Assuring the quality of data in the pesticide residue laboratory.** *J. Environ. Sci. Health B* 15(6): 1059-1070; 1980 (3 references).

The importance of accurate methods and quality control in the collection of data on pesticide residues is discussed. The quality of residue data is defined as the totality of features and characteristics of a measurement system which determines its ability to satisfy a given purpose. The contributions of adequate facilities and equipment, proper personnel training, and careful selection and preservation of samples to the final accuracy of pesticide residue data are considered. The identification of a pesticide residue in a laboratory should be confirmed by as many analytical techniques as are available in that facility. Other quality control objectives for intralaboratory pesticide residue analysis programs are outlined.

81-0889. Lopez-Avila, V. (Environ. Anal. Sect., Midwest Res. Inst., Kansas City, MO 64110) **Analysis of sludge extracts by high resolution GC with selective detectors.** *J. High Resolut. Chromatogr. Chromatogr. Commun.* 3(11): 545-550; 1980 (11 references).

A comparison of detectors used in the gas chromatographic (GC) analysis of sludge is presented. A Varian Model 3700 GC equipped with a model 1070 glass capillary split-splitless injector and a model 2110 capillary effluent splitter was used with a flame ionization detector; (FID)/electron capture detector (ECD), FID/thermionic nitrogen-phosphorus detector (TSD), FID/flame photometric detector (FPD), and ECD/TSD. The FID/FDP test mixture contained several compounds including methyl parathion. The technique was successful in profiling organics extracted from sludge without extensive sample cleanup.

81-0890. Rao, C. D.; Shethna, Y. I. (Microbiol. & Cell Biol. Lab., Indian Inst. Sci., Bangalore 560012, India) **A simple technique for purification of the parasporal crystal (γ-endotoxin) of *Bacillus thuringiensis* var *thuringiensis*.** *J. Indian Inst. Sci. Sect. C* 62(4): 1-11; 1980 (18 references).

A simple, rapid and inexpensive technique for the separation of crystals and spores of the microbial insecticide *Bacillus thuringiensis* var *thuringiensis* is presented. The parasporal protein crystal is highly toxic when ingested by lepidopteran larvae, and efficient separation of spores from crystals is necessary for studying the chemistry of the crystal. The technique involves preferential aggregation of crystals and their subsequent separation from the spores in a column containing 0.001 *M* NaH_2PO_4, 0.4 *M* NaCl, and 10% glycerol at pH 5.5. Effects of pH, salt concentration, column buffer and cellular debris on the method were determined. The method is suitable for large scale purification, and yields 99% pure crystals with about 60% crystal recovery.

81-0891. Ono, S.; Toyama, N.; Sugioka, K.; Tokieda, M.; Nomura, S.; Tsukada, S. (Fine Chem. Res. Lab., Nippon Soda Co. Ltd., Odawara, Kanagawa, Japan) **[Residue analysis of alloxydim-sodium and its degradation products.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(4): 575-584; 1980 (3 references) (Japanese).

A method for residue analysis of the selective herbicide, alloxydim-sodium, and its degradation products in crops and soils was determined. Three different analytical

methods, high performance liquid chromatography (HPLC), gas chromatography (GC), and ultra-violet spectrophotometry (UV) were investigated. HPLC was found to be the most suitable for detecting alloxydim and its degradation products, after extraction with methanol. Compounds present in the aqueous methanol were then separately re-extracted with *n*-hexane and dichloromethane. Alloxydim in *n*-hexane was cleaned up by liquid-liquid separation. The degradation products present in dichloromethane were cleaned up with TLC. Each compounds was then determined by HPLC. The lower limit of detection for each compound was 0.01 ppm. Recoveries of alloxydim-sodium were 86-93% in crops and 85-91% in soils. Degradation products were recovered at 75-92% in crops and at 87-92% in soils.

81-0892. Nagayoshi, E.; Nogawa, K.; Shiga, N.; Matano, O.; Goto, S. (Inst. Environ. Toxicol., Kodaira, Tokyo, Japan) **[Determination of methoxyphenone, a herbicide, residue in crops by high-performance liquid chromatography.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(4): 615-618; 1980 (3 references) (Japanese).

Residues of the herbicide methoxyphenone (3,3-dimethyl-4- methoxy-benzophenone) in watermelons, tomatos, carrots, rice grains and rice straws were extracted with acetone, and partitioned into chloroform from an aqueous solution after distillation of acetone from the extract. Chloroform was distilled off and the residue was cleaned up by 2 column chromatography steps. Silica gel (10 g) was used as the adsorbent for the first chromatography. Methoxyphenone was eluted with 100 ml of benzene containing 5% v/v ethyl acetate after washing with 60 ml of benzene. For the second chromatography, 2 g of alumina containing 0.1 ml of a 50% aqueous silver nitrate solution was added to the 10g florisil column. Methoxyphenone was eluted with 100 ml of benzene containing 5% v/v of ethyl ether after washing with 100 ml of benzene. Then the residue was dissolved in 1 ml of methanol, and 80 μl of the solution was injected into a high-performance liquid chromatograph provided with a column (4.6 mm in diameter and 25 cm in length) packed with JASCO-SC-02. The column was eluted with a 75:25 mixture of methanol and water at a flow rate of 2 ml/min. The detector was UVIDEC-100 and the wave-length was 295 nm. The liquid chromatogram was much clearer than the gas chromatogram with ECD without interfering peaks in any specimens. The lower limits of detection were 0.005 ppm in watermelon, tomato, carrot and rice grain, and 0.03 ppm in rice straw. The method presented was as sensitive as gas chromatography with ECD. The average recoveries of methoxyphenone were 88-93%.

81-0893. Ono, S.; Toyama, N. (Fine Chem. Res. Lab., Nippon Soda Co. Ltd., Odawara, Kanagawa, Japan) **[Residue analysis of benzomate, an acaricide, by high-performance liquid chromatography.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 5(4): 623-626; 1980 (3 references) (Japanese).

Analytical determination of the acaricide benzomate in orange and apple samples were performed. The specimens were extracted with methanol, and the extract was re-extracted with dichloromethane. The final extract was evaporated under reduced pressure, the residue was diluted with acetonitrile, and then washed with *n*-hexane. The acetonitrile layer was evaporated to dryness, the residue was dissolved in dichloromethane, and the solution was spotted onto a thin layer chromatography plate. Benzomate was eluted with methanol after development with dichloromethane. After evaporation of the solvent, the residue was dissolved in 1 ml acetonitrile and 10 μl of this solution was injected into an HPLC column (4.6 mm × 25 cm) packed with Zorbax C8. The column was eluted with 8:2 (v/v) acetonitrile:water at a flow rate of 1 ml/min. The absorbance was measured at 254 nm. The limit of detection, with a 50 g sample, was 0.04 ppm and the recovery was ~ 80%.

81-0894. Gorbach, S. (Hoechst Aktiegesellschaft, D-6230 Frankfurt 80, BRD) **A review of methods for the residue analysis of the systemic fungicides benomyl, carbendazim, thiophanate methyl and thiabendazole.** *Pure Appl. Chem.* 52(11): 2569-2590; 1980 (92 references).

Residue analysis methods for the systemic fungicides benomyl, carbendazim, thiophanate methyl, and thiabendazole, along with many of their metabolites, are reviewed. Transformations to stable compounds, characteristic of the various fungicides and metabolites, were considered. The various steps of analysis were then discussed, with specific modifications and techniques applied to each compound. Extraction is generally carried out with methanol, ethanol, acetone, or chloroform alone or in combination with ammonium chloride or hydrochloric acid. Clean up is conducted by a variety of methods; the method is determined by the specificity and sensitivity of the selected detection method. Detection methods include bioassay, colorimetry, spectrophotometry, high performance liquid chromatography, gas liquid chromatography and fluorimetry. Detection limits range from 0.0006 mg/kg for *in situ* fluorimetry to 0.1 mg/kg for fluorimetry, colorimetry or UV spectrophotometry. Multi-residue analysis methods are also discussed. High performance liquid chromatography is recommended for multi-residue analysis.

81-0895. Bradway, D. E.; Lores, E. M.; Edgerton, T. R. (Environ. Toxicol. Div., Health Effects Res. Lab., US EPA, Research Triangle Park, NC 27711) **Minimizing occupational exposure to pesticides: recent developments in methodology for monitoring pesticide metabolites in human urine.** *Residue Rev.* 75: 51-65; 1980 (13 references).

Laboratories involved in monitoring human exposure to pesticides have a constant need for new methodology and improvement of existing methodology for the analysis of pesticide metabolites in urine. Several recent developments should prove especially valuable to these laboratories. A gas chromatographic method for the analysis of the urinary metabolites of triazine herbicides is now available. This method detects levels of metabolites as low as 0.01 ppm and involves a simple extraction followed by quantitation of the underivatized metabolite by GC using a nitrogen-phosphorus specific detector. Methodology for the analysis of alkyl phosphate metabolites of OP pesticides is being developed using reagents which do not have the high carcinogen hazard of previously used reagents. This methodology employs a technique known as extractive alkylation to produce derivatives of the alkyl phosphates which are amenable to GC analysis. Liquid chromatography has been applied to the analysis of phenols and anilines, permitting quantitative determination of the free compound following a simple extraction from urine. Newly developed GC columns also permit quantitation of free phenols. (Author abstract by permission)

81-0896. Gunther, F. A. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Minimizing occupational exposure to pesticides: reliability of analytical methodology.** *Residue Rev.* 75: 113-126; 1980 (24 references).

Pesticide residue data to be utilized by public health professionals in monitoring and maintaining safe pesticide-prone work environments consist of residue levels encountered in factory and field air, in airborne particulate matter, on skin and clothing, on entrapment patches, in field-floor soil dust, and on foliage. Considering all the cogent variables involved from sample collection to final analytical and interpretive (safe or not safe) calculation, final residue values must be regarded as approximate numbers. (Author abstract by permission)

81-0897. Stoeber, I.; Schulten, H. R. (Landesanst. Wasser & Abfall Nordrhein Westfalen, D-4000 Dusseldorf 1, BRD) **Combined application of high-pressure liquid chromatography and field desorption mass spectrometry for the determination of biocides of the phenylurea- and carbamate-type in surface water.** *Sci. Total Environ.* 16(3): 249-262; 1980 (15 references).

A method for identifying environmental pollutants by combined high-pressure liquid chromatography (HPLC) and field desorption mass spectrometry (FD-MD) is described. HPLC methods have been in wide use for determination of organic compounds, especially polar substances of low vapor pressure. Recent work in coupling HPLC with FD-MS has enabled the direct, reliable identification of trace levels of herbicides. Phenylurea-, carbamate- and thiocarbamate-type herbicides were detected at 10-50 ng levels in 2 *l* Rhine River water samples. The benefits of this method include short analysis time, small sample consumption, reliability, and high selectivity in analyzing mixtures of biocides.

81-0898. Hertz, H. S.; Chesler, S. N. (Natl. Bur. Stand., Washington, DC) **Trace organic analysis: a new frontier in analytical chemistry.** *US NTIS PB Rep.* PB80-811,532: p. 59; 1980.

Researchers in diverse areas must currently perform critical analyses on minute quantities of organic compounds [including PCBs, Kepone (chlordecone) and other pesticides] in various matrices. It was the aim of this symposium to bring together scientists to discuss common problems and to explore current and impending technology for organic analyses. Emphasis was placed on the total analysis, from collecting the sample through interpreting the results, rather than upon the measurement only. Topics covered in the proceedings are as follows: sampling and sampling handling for trace organic analysis, state-of-the-art analytical systems, analytical techniques on the horizon, analysis of nutrients, analysis of organic pollutants and their metabolites in the ecosystem, analysis of drugs in body fluids, analysis of food toxicants, and analysis of hormones and neuro-transmitters. (Author abstract by permission)

81-0899. Zupancic, L.; Marsel, J. (Dep. Chem., Univ. Ljubljana, Ljubljana, Yugoslavia) **On the determination of trace amounts of chlorinated organic substances in water.** *Vestn. Slov. Kem. Drus.* 25(4): 409-417; 1979 (17 references).

The applicability of solvent extraction by *n*-hexane of organic pollutants, in particular for chlorinated compounds in water, is demonstrated at the ppt level. The detection limit for the method discussed is ~ 10 ng/l for various pesticides. GLC or GC-MS determinations were reproducible over a wide concentration range with standard deviations of 10% for concentrations above 10 ng/l, and 20% for lower concentrations. Charcoal was added directly to water samples in a separation funnel and after filtration the charcoal was extracted with acetone in a Soxhlet apparatus. The volume of the acetone fraction was reduced to about 5 ml, and after addition of 30 ml water, extraction with *n*-hexane and chromatographic determination of the added compounds was performed. For adsorption of Amberlite XAD, the resins were extracted for 24 hr with methanol in a Soxhlet apparatus and packed into a glass column. Adsorbed compounds from water samples were eluted with 70 ml acetone, concentrated to a smaller volume, and injected into the chromatographic column.

81-0900. Karabut, N. E.; Senetskaya, L. P. (D. I. Mendeleev Chem. Technol. Inst., Moscow, USSR)

Opredelenie gerbitsidov na osnove mocheviny metodom kislotno-osnovnogo spektrofotometricheskogo titrovaniya. [Determination of urea herbicides using acid-base spectrophotometric titration.] *Zh. Anal. Khim.* 35(9): 1793-1798; 1980 (7 references) (Russian).

A spectrophotometric method of acid-base titration of the herbicides Kotoran (fluometuron), Meturin, and their impurities was developed. The solvent was a mixture of acetonitrile and chloroform (1:10). The method allowed determination of an active ingredient and its metabolites in the waste waters and technical products. The accuracy of determination was almost 100%.

See also 81-0602, 81-0627, 81-0638, 81-0639, 81-0643, 81-0670, 81-0673, 81-0685, 81-0687, 81-0702, 81-0790 *and* 81-0806.

PESTICIDES ABSTRACTS

QUARTERLY INDEX

JANUARY — MARCH, 1981, Vol. 14, Nos. 1-3

PREFACE

The basic design for this index was supplied by the Management Support Division, Office of Pesticides and Toxic Substances, Environmental Protection Agency. It consists of two subject indexes (concept and compound) and two author indexes (personal and corporate). Primary and secondary headings in the Concept Index appear as subordinate headings in the Compound Index, both indexes having three levels of specificity.

In the Concept Index, only general aspects are indexed under the broader terms shown below. For specific terms, the reader should consult the appropriate heading in the Concept Index, selecting the narrower term that best fits his need.

Compounds are indexed by their common names; where other designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under the broader headings (e.g., organochlorines, herbicides, etc.).

Alternative controls
Analysis
Beneficial effects
Biochemical effects (*see also* Enzyme activity)
Body fluids
Carcinogenesis
Cardiovascular system
Cytological effects (*see also* Mutagenesis)
Digestive system
Economics
Endocrine system (*see also* Reproduction/growth)
Environmental pollution
Enzyme activity (*see also* Biochemical effects)
Experimental design
Factors influencing metabolism/toxicity
Immunology
Integumentary system
Laws and regulations
Metabolism
Morbidity and mortality statistics
Musculoskeletal system
Mutagenesis (*see also* Cytological effects)
Nervous system
Nomenclature
Photodecomposition (*see also* Residue degradation)
Phytotoxicity
Poison control centers
Prevention
Reproduction/growth (*see also* Endocrine system)
Residue degradation (*see also* Photodecomposition, Thermodecomposition *and* Biotransformation)
Residue dynamics
Residue removal
Residues/air
Residues/food and feed
Residues/human
Residues/non-target organisms
Residues/plants
Residues/soil
Residues/water
Respiratory system
Reticuloendothelial system
Reviews
Safety standards
Sensory system
Teratogenesis
Thermodecomposition (*see also* Residue degradation)
Toxicity/experimental organisms
Toxicity/humans
Toxicity/non-target organisms

Subject Index: Concepts

Absorption
see also Translocation
Annelids
Aldicarb, 81-0236
Aldrin, 81-0236
Captafol, 81-0236
Captan, 81-0236
Carbaryl, 81-0236
Carbendazim, 81-0236
Carbofuran, 81-0235
Chlorfenvinphos, 81-0236
Diazinon, 81-0236
3,4-Dichlorophenylurea, 81-0236
Dieldrin, 81-0236
Dowco-275, 81-0236
Fenamiphos, 81-0236
Fenuron, 81-0236
Folpet, 81-0236
Hexachlorobenzene, 81-0236
Methyl pentafluorophenyl sulfone 81-0236
Oxamyl, 81-0235
Parathion, 81-0236
Phorate, 81-0236
Simazine, 81-0236
1,2,3,5-Tetrachlorobenzene 81-0236
Cow
Mefluidide, 81-0210
Dog
Deet, 81-0531
Repellents, 81-0531
Fish
Atrazine, 81-0557
Carbamates, 81-0801
Chlorpyrifos, 81-0064
Dioctyl phthalate, 81-0064
Hexachlorobenzene, 81-0064
Lindane, 81-0158
Organochlorines, 81-0801
Organophosphates, 81-0801
Trichlorobenzenes, 81-0158
Human
Chlorpropham, 81-0733
Chlorpyrifos, 81-0733
Dinoseb, 81-0733
PCP, 81-0733
Thallium, 81-0185
Thallium sulfate, 81-0185
In vitro
Diquat, 81-0742
Paraquat, 81-0742
Insects
Carbamates, 81-0801
Organochlorines, 81-0801
Organophosphates, 81-0801
Molluscs
Atrazine, 81-0557
Carbamates, 81-0801
Organochlorines, 81-0801
Organophosphates, 81-0801
Monkey
Dieldrin, 81-0255
Mouse

Absorption (cont'd)
Dieldrin, 81-0255
Organomercury fungicides 81-0752
Plankton/algae
Prometryne, 81-0089
Plants
Herbicides, 81-0353
Thiazoles, 81-0365
Rabbit
Dieldrin, 81-0255
Rat
Dieldrin, 81-0255
Sheep
Mefluidide, 81-0210

Acid-base balance
see Biochemical effects

Adrenal
see also Endocrine system
Animals/experimental
Lindane, 81-0180
2,4,5-T, 81-0180

Alimentary tract
see also Digestive system
Animals/experimental
Chlorfenvinphos, 81-0474
Fenitrothion, 81-0204
Human
Rodenticides, 81-0491
Sodium fluoride, 81-0491

Alternative controls, 81-0009, 81-0010 81-0011, 81-0012, 81-0014 81-0015, 81-0041, 81-0043 81-0047, 81-0168, 81-0618
Bacillus sphaericus, 81-0040
Bacillus thuringiensis, 81-0029 81-0312, 81-0357, 81-0615
Diflubenzuron, 81-0030
Fungi, 81-0316
Gambusia affinis, 81-0313
Gossyplure, 81-0054
Herbicides, 81-0032
Insect hormones and analogs 81-0324, 81-0340, 81-0341
Methoprene, 81-0324
Microbials, 81-0013
Nematodes, 81-0317
Nosema locustae, 81-0026
Trans-2-nonenal, 81-0612

Amino acids/peptides/proteins
see also Biochemical effects
Animals/experimental
Chlorfenvinphos, 81-0473
DDT, 81-0220
Ethylene dibromide, 81-0751
Phosphamidon, 81-0178
PMA, 81-0240
Tepa, 81-0757
Warfarin, 81-0546
Human
Warfarin, 81-0536

Amino acids/peptides/proteins (cont'd)
In vitro
Alachlor, 81-0033
Atrazine, 81-0033
Buthidazole, 81-0033
Chlorfenvinphos, 81-0476
Dethatyl-ethyl, 81-0033
DFP, 81-0769
Dicrotophos, 81-0769
EPTC, 81-0033
Lindane, 81-0553
Metolachlor, 81-0033
Paraquat, 81-0495, 81-0853
Warfarin, 81-0533, 81-0536
Plants
Atrazine, 81-0301
Chlormequat chloride, 81-0642
2,4-D, 81-0301
Dialene, 81-0642
Dicamba, 81-0301
Lenacil, 81-0301
Malathion, 81-0336
Phenoxy acids, 81-0017
Substituted ureas, 81-0017
Triazine herbicides, 81-0017

Analysis
see also Bioassay; Chromatography; Electrometry; Enzyme assay; Immunoassay; Spectrometry; Titration
General, 81-0036, 81-0888, 81-0896
Diazinon, 81-0282
Dioctyl phthalate, 81-0263
Fensulfothion, 81-0285
Methyl parathion, 81-0282
Organic arsenicals, 81-0202
Parathion, 81-0282
Polychlorinated biphenyls 81-0276
Sample preparation, 81-0259 81-0856
Aldrin, 81-0872
Alloxydim-dosium, 81-0891
Aminocarb, 81-0882
Asulam, 81-0272
Bacillus thuringiensis, 81-0890
Benzoximate, 81-0893
Bromoxynil, 81-0271
Carbamates, 81-0286, 81-0864
Chlordecone, 81-0864
2,4-D, 81-0271
DDE, 81-0262, 81-0278, 81-0864
DDT, 81-0260, 81-0270
Dieldrin, 81-0300
Dioxins, 81-0602
Endosulfan, 81-0863
Fungicides, 81-0881
Hexachlorobenzene, 81-0262 81-0873
MCPA, 81-0266
Methazole, 81-0291
Methidathion, 81-0864
Methoxyphenone, 81-0892

Analysis (cont'd)
Mirex, 81-0864
Organochlorines, 81-0256
81-0260, 81-0277, 81-0587
81-0899
Organophosphates, 81-0296
81-0587
PCP, 81-0864, 81-0873
Phenoxy acids, 81-0864
Polychlorinated biphenyls
81-0260, 81-0277, 81-0278
TCA, 81-0267
Thiabendazole, 81-0269

Behavior
see also Nervous system
Animals/experimental, 81-0609
Captan, 81-0787
Carbofuran, 81-0787
Chlorpyrifos, 81-0787
2,4-D, 81-0162, 81-0534
Diazinon, 81-0787
Organochlorines, 81-0493
Picloram, 81-0534

Beneficial effects, 81-0041
DDT, 81-0039
Decamethrin, 81-0039
Malathion, 81-0039
Parathion, 81-0039
Permethrin, 81-0039
Propoxur, 81-0039

Bibliographies, 81-0041, 81-0636
Organochlorines, 81-0639

Bile
see Body fluids

Bioassay
see also Analysis
81-0850
Carbaryl, 81-0157
Chlordane, 81-0157
2,4-D, 81-0157
DDT, 81-0157
Dieldrin, 81-0436
Fungicides, 81-0597
Herbicides, 81-0597
Insect hormones and analogs
81-0597
Insecticides, 81-0597
Lindane, 81-0750
Malathion, 81-0157
Methoxychlor, 81-0157
PCP, 81-0154
Toxaphene, 81-0154
Trifluralin, 81-0157

Biochemical effects
see also Amino acids/peptides/proteins; Biogenic amines; Electrolytes; Electron transport Enzyme activity; Lipids/steroids/sterols; Nucleic acids; Porphyrins/pigments; Respiration, cellular; Vitamins/coenzymes
General
Dichlorvos, 81-0172
Methoxychlor, 81-0224
Animals/experimental
Paraquat, 81-0475
PCP, 81-0847
Biogenic amines
Lindane, 81-0180
Phosphamidon, 81-0177
2,4,5-T, 81-0180
Human
BPMC, 81-0796
Edifenphos, 81-0796
Fenthion, 81-0796
Mevinphos, 81-0803
Paraquat, 81-0795
PCP, 81-0693
In vitro
Paraquat, 81-0768
Mouse
Dioxins, 81-0610
Plants
Maleic anhydride, 81-0305
PCP, 81-0527
Phenoxy acids, 81-0019
Substituted ureas, 81-0019
Triazine herbicides, 81-0019
Porphyrins/pigments
DBCP, 81-0165

Biogenic amines
see also Biochemical effects
Animals/experimental
Chlordecone, 81-0530
DDE, 81-0481
DDT, 81-0481
Dieldrin, 81-0481
Mirex, 81-0530
Paraoxon, 81-0756
Polychlorinated biphenyls
81-0481
Rotenone, 81-0214
Biochemical effects
Lindane, 81-0180
Phosphamidon, 81-0177
2,4,5-T, 81-0180
In vitro
Chlordecone, 81-0530
Mirex, 81-0530

Biotransformation
see also Metabolism; Residue degradation
General
Aldrin, 81-0773
Heptachlor, 81-0773
Lindane, 81-0773
Malathion, 81-0773
Methoxychlor, 81-0773
Molinate, 81-0773
Organochlorines, 81-0773
Parathion, 81-0773
Phenoxy acids, 81-0773
2,4,5-T, 81-0773
Fish
Carbofuran, 81-0753
Hamster
Dioxins, 81-0362
In vitro
Aldrin, 81-0764
Carbofuran, 81-0753
Dieldrin, 81-0764
Methyl engenol, 81-0852
Microorganisms
Aldrin, 81-0678
Atrazine, 81-0371, 81-0644
Carboxin, 81-0408
DDT, 81-0678
Ethylene dibromide, 81-0751
Heptachlor, 81-0678
Molinate, 81-0083
p-Nitrophenol, 81-0061
Oxycarboxin, 81-0408
Oxydemeton methyl, 81-0091
Parathion, 81-0061
Substituted amines, 81-0076
2,4,5-T, 81-0678
Plankton/algae
Daminozide, 81-0112
DPX-3217, 81-0092
Maleic hydrazide, 81-0112
Methidathion, 81-0095
Quintozene, 81-0085
Plants
Alachlor, 81-0656
IBP, 81-0654
Permethrin, 81-0108
Rat
ANTU, 81-0187
Ethylene dibromide, 81-0751
Methyl engenol, 81-0852
Paraquat, 81-0187

Bladder/ducts
see Excretory system

Blood-brain barrier
see Cardiovascular system; Nervous system

Blood cells
Animals/experimental
Butachlor, 81-0800
Carbaryl, 81-0176
Chlordimeform, 81-0800
Chlorfenvinphos, 81-0473
Chlorobenzilate, 81-0800
CNP, 81-0800
Disulfoton, 81-0800
Fenitrothion, 81-0800
Methomyl, 81-0800
MTMC, 81-0800
Phosphamidon, 81-0477
Pyriminil, 81-0539
Thiophanate-methyl, 81-0800
Warfarin, 81-0545
Zinc phosphide, 81-0539
Zineb, 81-0800
In vitro
Chlorfenvinphos, 81-0476

Blood pressure
see Cardiovascular system

Blood vessels
see Cardiovascular system

Body fluids
Animals/experimental
Chlordimeform, 81-0150

Brain
see also Nervous system
Animals/experimental
Dichlorvos, 81-0496
Fenitrothion, 81-0250
Paraoxon, 81-0756
Nervous system
Phosphamidon, 81-0177, 81-0178

Carbohydrates
see also Biochemical effects
Animals/experimental
Deet, 81-0844
Human
Pyriminil, 81-0497
Plants
Chlormequat chloride, 81-0641

Carcinogenesis
General, 81-0601, 81-0607, 81-0608 81-0741
Acephate, 81-0776
Aldrin, 81-0777
BHC, 81-0777
Bromacil, 81-0776
Cacodylic acid, 81-0776
Captan, 81-0776
Carbamates, 81-0740
Chlordane, 81-0777
Chlordecone, 81-0457, 81-0777
DBCP, 81-0457
DDT, 81-0198
Demeton, 81-0776
Dieldrin, 81-0777
Dioxins, 81-0356, 81-0457 81-0777
Ethylene dibromide, 81-0457
Folpet, 81-0776
Isophos-3, 81-0198
Lindane, 81-0198
Maleic hydrazide, 81-0777
Mirex, 81-0777
Monocrotophos, 81-0776
Organophosphates, 81-0740
Simazine, 81-0776
Strobane, 81-0777
Substituted ureas, 81-0231
Trichlorfon, 81-0776, 81-0777
Animals/experimental
Aldrin, 81-0186
Amitrole, 81-0544
Captan, 81-0451, 81-0779
Carbamate herbicides, 81-0199
Carbamates, 81-0199
Chloramben, 81-0779
Chlormequat chloride, 81-0849
Chlorobenzilate, 81-0779
DBCP, 81-0779
DDT, 81-0758
Di-allate, 81-0544
Dicofol, 81-0779
Dieldrin, 81-0186
Dimethoate, 81-0779
Dioxins, 81-0805
Dithiocarbamates, 81-0199

Carcinogenesis (cont'd)
Ethylene dibromide, 81-0779
Hexachlorobenzene, 81-0513
Nitrofen, 81-0215, 81-0779
Organochlorines, 81-0544 81-0779
Organophosphates, 81-0779
Polychlorinated biphenyls 81-0544
Pronamide, 81-0197
Quintozene, 81-0779
Substituted ureas, 81-0199
Sulfallate, 81-0779
Thiocarbamate herbicides 81-0199
Trifluralin, 81-0779
Human
Chlordane, 81-0147
2,4-D, 81-0348
Dioxins, 81-0452
Herbicides, 81-0450
MCPA, 81-0348
Organic arsenicals, 81-0202
Phenoxy acids, 81-0450
2,4,5-T, 81-0348, 81-0452

Cardiovascular system
see also Heart
Animals/experimental
Chlordimeform, 81-0759

Cartilage
Animals/experimental
Aldrin, 81-0153
Dieldrin, 81-0153

Cell membranes
see also Cytological effects
General, 81-0601
Animals/experimental
Methylmercuric chloride, 81-0244
In vitro
Diuron, 81-0354
Lindane, 81-0553
Plants
Cyanazine, 81-0334
Glyphosate, 81-0368
Paraquat, 81-0334
PCP, 81-0527

Cerebrospinal fluid
see Body fluids

Chromatography
see also Analysis
General, 81-0855
DDE, 81-0278
Diflubenzuron, 81-0345
Polychlorinated biphenyls 81-0278
Column
Daminozide, 81-0592
DDT, 81-0260
Herbicides, 81-0562
MCPA, 81-0266
MSMA, 81-0592
Organochlorines, 81-0260
Polychlorinated biphenyls 81-0260
Substituted ureas, 81-0562

Chromatography (cont'd)
Electrophoresis
Bacillus thuringiensis, 81-0565
Gas-liquid, 81-0259, 81-0588 81-0886
Aldrin, 81-0570, 81-0872, 81-0877
Alloxydim-dosium, 81-0891
Aminocarb, 81-0879, 81-0882
Anilazine, 81-0584
Atrazine, 81-0591, 81-0875
Auxins, 81-0578
BHC isomers, 81-0596
Bromophos, 81-0297
Bromoxynil, 81-0271, 81-0422
Carbaryl, 81-0879
Carbofuran, 81-0879
Chloramben, 81-0876
Chlordane, 81-0570, 81-0580
Chlorpyrifos, 81-0595
2,4-D, 81-0271, 81-0871
Daminozide, 81-0423
DBCP, 81-0594
DDE, 81-0262
DDT, 81-0580
DDT derived compounds 81-0574
o-Dichlorobenzene, 81-0293
Dieldrin, 81-0300
Dimethoate, 81-0295
Dioxins, 81-0328, 81-0569
Diuron, 81-0261
Ethylene dibromide, 81-0275 81-0593
Ethylene dichloride, 81-0293
Fenthion, 81-0297
Fenuron, 81-0599
Fluridone, 81-0585
Fumigant insecticides, 81-0880
Fumigants, 81-0564
Fungicides, 81-0881
Herbicides, 81-0562
Hexachlorobenzene, 81-0257 81-0262, 81-0287, 81-0580 81-0596, 81-0873
Lindane, 81-0298, 81-0570
Malathion, 81-0295
Metalaxyl, 81-0884
Methidathion, 81-0284
Methiocarb, 81-0879
Methomyl, 81-0879
Methoxychlor, 81-0283
Methyl parathion, 81-0281 81-0295, 81-0889
Methylene chloride, 81-0293
Mirex, 81-0279, 81-0287, 81-0561
Naphthalene, 81-0293
Nitrobenzene, 81-0293
Organochlorines, 81-0295 81-0877, 81-0878, 81-0887 81-0899
Organophosphates, 81-0268 81-0295, 81-0296, 81-0895
Organotin fungicides, 81-0870
Paraquat, 81-0590
Parathion, 81-0281, 81-0297
PCP, 81-0571
Phenmedipham, 81-0599

Chromatography (cont'd)
Phenoxy acids, 81-0288
Phosalone, 81-0295
Pirimicarb, 81-0879
Polychlorinated biphenyls 81-0277, 81-0580, 81-0877
Prometryne, 81-0875
Pronamide, 81-0265
Propoxur, 81-0290, 81-0879
Pyrethrins, 81-0572
Quinones, 81-0878
Simazine, 81-0875
Substituted ureas, 81-0562
Triazine herbicides, 81-0895
HPL, 81-0858
Alloxydim-dosium, 81-0891
Amitrole, 81-0883
Atrazine, 81-0591
Benomyl, 81-0582
Benzoximate, 81-0893
BHC isomers, 81-0861
Bromophos-ethyl, 81-0861
Captan, 81-0579
Carbamate herbicides, 81-0897
Carbamates, 81-0286
Carbendazim, 81-0573, 81-0582
DDT, 81-0270
Dicofol, 81-0583
Dimethoate, 81-0861
Dioxins, 81-0289
Dithianon, 81-0874
Diuron, 81-0261
Ethylene thiourea, 81-0576
Fenvalerate, 81-0274
Flurecol-butyl, 81-0861
Fungicides, 81-0859
Glyphosate, 81-0292
Herbicides, 81-0859
Insecticides, 81-0859
Ioxynil, 81-0861
MCPA, 81-0861
Methazole, 81-0291
Methoxyphenone, 81-0892
PCP, 81-0873
Permethrin, 81-0274
Phenothiazine, 81-0280
Phenoxy acids, 81-0288
Resmethrin, 81-0274
Substituted ureas, 81-0897
Thiabendazole, 81-0269
Thiocarbamate herbicides 81-0897
Liquid, 81-0856, 81-0895
Asulam, 81-0272
Carbamate herbicides, 81-0258
Carbamates, 81-0258
Dioxins, 81-0602
Dithiocarbamates, 81-0857
Herbicides, 81-0857
Parathion, 81-0857
Rodenticides, 81-0857
Thin-layer, 81-0294
Benomyl, 81-0581, 81-0860
Benzoximate, 81-0893
BHC isomers, 81-0861
Bromophos-ethyl, 81-0861
Carbamates, 81-0865

Chromatography (cont'd)
Carbendazim, 81-0581
Chloramben, 81-0876
Chlormequat chloride, 81-0577
4-Chloroaniline, 81-0589
DDE, 81-0559
DDT, 81-0559
DDT derived compounds 81-0559
3,4-Dichloroaniline, 81-0589
Dichlorvos, 81-0598
Dimethoate, 81-0861
Diphacinone, 81-0860
Fenitrothion, 81-0598
Flurecol-butyl, 81-0861
Ioxynil, 81-0861
Lindane, 81-0298
MCPA, 81-0861
Metalaxyl, 81-0885
Organochlorines, 81-0865
Organophosphates, 81-0865
PCP, 81-0299
Phenoxy acids, 81-0288
Quinomethionate, 81-0860
Ronnel, 81-0598
TDE, 81-0559
Trichlormetaphos-3, 81-0598

Chromosomes/genes
see also Cytological effects
Animals/experimental
Benomyl, 81-0251
Human
Atrazine, 81-0711
Herbicides, 81-0711
TCPE, 81-0711
In vitro
Atrazine, 81-0749
Benomyl, 81-0251
Propham, 81-0510
Substituted ureas, 81-0231
Microorganisms
Carbendazim, 81-0788
Fungicides, 81-0229
Thiabendazole, 81-0788

Cytochromes
see Cytological effects

Cytological effects
see also Cell membranes; Chromosomes/genes; Microsomes; Microtubules; Mitochondria; Mitosis/meiosis; Ultrastructure/morphology
In vitro
DFP, 81-0769
Dicrotophos, 81-0769
Mitochondria
DBCP, 81-0165
Fentrifanil, 81-0164
Phytotoxicity
Leptophos, 81-0191
Plants
Carboxin, 81-0189, 81-0190
Mancozeb, 81-0189, 81-0190
Nitroanilines, 81-0044

Digestive glands
see also Digestive system
Human
Paraquat, 81-0744

Digestive system
see also Alimentary tract; Digestive glands; Liver; Pancreas (exocrine)
General, 81-0470

Distribution/storage
General
Aldrin, 81-0773
Carbaryl, 81-0659
Chlordecone, 81-0659
Heptachlor, 81-0773
Lindane, 81-0773
Malathion, 81-0773
Methoxychlor, 81-0773
Molinate, 81-0773
Organochlorines, 81-0773
Parathion, 81-0773
Phenoxy acids, 81-0773
2,4,5-T, 81-0773
Chicken
Leptophos, 81-0792, 81-0799
Cow
Mefluidide, 81-0210
Crustacea
Mirex, 81-0480
Fish
Atrazine, 81-0557
Lindane, 81-0750
Goat
Permethrin, 81-0209
Hamster
Dioxins, 81-0362
Human
Carbamates, 81-0865
Organochlorines, 81-0865
Organophosphates, 81-0865
In vitro
Chlordecone, 81-0771
Molluscs
Atrazine, 81-0557
Heavy metals, 81-0161
Monkey
Dieldrin, 81-0255
Mouse
Aldrin, 81-0153
Dieldrin, 81-0153, 81-0255
Organomercury fungicides 81-0752
Paraquat, 81-0550
Plankton/algae
Prometryne, 81-0089
Plants
Fenapanil, 81-0025
Fenarimol, 81-0025
Nitrofen, 81-0658
Quail
DDT, 81-0538
Rabbit
Dieldrin, 81-0255
Rat
BHC, 81-0205
Carbon tetrachloride, 81-0503

Distribution/storage (cont'd)
Chlordecone, 81-0503, 81-0771
Dieldrin, 81-0255
Mirex, 81-0503
Paraquat, 81-0511
Photomirex, 81-0503
Sheep
Mefluidide, 81-0210

Economics, 81-0015, 81-0622

EEG
see also Nervous system
Animals/experimental
Paraoxon, 81-0756

Eggshell effects
Animals/experimental
Organochlorines, 81-0493
In vitro
DDE, 81-0500
DDT, 81-0500

Electrolytes
see also Biochemical effects
Animals/experimental
Deet, 81-0844
Sodium fluoroacetate, 81-0841
In vitro
Dichlorvos, 81-0568
Dinocap, 81-0568
Trichlorfon, 81-0568

Electrometry
see also Analysis
Polarography
PCP, 81-0571

Electron transport
see also Biochemical effects
Plants
Dinoseb, 81-0023
Oxyfluorofen, 81-0366

Electrophysiology
see Nervous system

Embryo/fetus
see also Reproduction/growth
General
Kalixin, 81-0198
Pyrazophos, 81-0198
Animals/experimental
DDT, 81-0538
Dithiocarbamates, 81-0199
Glyphosate, 81-0489
Methylmercuric chloride, 81-0244
Human
Warfarin, 81-0170

Endocrine system
see also Adrenal; Hormones; Thyroid
Animals/experimental
Tributyltin, 81-0745

Endoplasmic reticulum
see Cytological effects

Environmental pollution, 81-0003
81-0035, 81-0042, 81-0604
81-0605, 81-0618, 81-0621
81-0637
BHC isomers, 81-0679
Carbon tetrachloride, 81-0124
Chlordane, 81-0679
Chlordecone, 81-0124
2,4-D, 81-0623
DBCP, 81-0653
DDT, 81-0653, 81-0679
Dieldrin, 81-0679
Dioxins, 81-0124, 81-0307, 81-0327
81-0623, 81-0722
Endosulfan, 81-0022
Hexachlorobenzene, 81-0679
Organochlorines, 81-0022, 81-0307
81-0323, 81-0363, 81-0640
Organomercury fungicides, 81-0633
PCP, 81-0307
Polychlorinated biphenyls, 81-0124
81-0679
2,4,5-T, 81-0623, 81-0722

Enzyme activity
see also Biochemical effects
General
Amitrole, 81-0249
Benacil, 81-0516
Benazolin, 81-0046
BHC, 81-0205, 81-0628
BHC isomers, 81-0232
Bromacil, 81-0046
Carbaryl, 81-0232
Carbon tetrachloride, 81-0179
Chlordimeform, 81-0499
Chloridazon, 81-0200
Chlorpropham, 81-0046, 81-0048
2,4-D, 81-0046
DDT, 81-0628
Dichlobenil, 81-0046, 81-0048
Dichlorvos, 81-0172
Diethyldithiocarbamic acid
81-0249
Dinoseb, 81-0046
Dioxins, 81-0226
Diphenamid, 81-0046
Disulfiram, 81-0249
Endrin, 81-0232
EPN, 81-0232
Ethephon, 81-0031
Fenitrothion, 81-0232, 81-0250
Hexachlorobenzene, 81-0226
Hydroxyatrazine, 81-0046
Lindane, 81-0230
Malathion, 81-0232
Mercarbam, 81-0232
Mercuric chloride, 81-0179
Monuron, 81-0048
Organophosphates, 81-0809
Parathion, 81-0232, 81-0499
81-0760
PCP, 81-0527
Phosphamidon, 81-0178
PMA, 81-0240
Pyrethrins, 81-0234
Trichlorfon, 81-0499
Warfarin, 81-0225, 81-0540

Enzyme activity (cont'd)
Zineb, 81-0230
Alkaline phosphatase
Malathion, 81-0247
Zinc phosphide, 81-0518
δ-Aminolaevulinate synthase
DBCP, 81-0165
ATPase
Chlordecone, 81-0530
DDE, 81-0500
DDT, 81-0500, 81-0755
Dinoseb, 81-0023
Malathion, 81-0247
Mirex, 81-0530
Carboxylase
Heptachlor, 81-0525
Lindane, 81-0525
Cholinesterase, 81-0470
Aldrin, 81-0781
Azinphosmethyl, 81-0774
BHC isomers, 81-0232
Carbamates, 81-0458, 81-0683
81-0728
Carbaryl, 81-0232, 81-0781
Chlorfenvinphos, 81-0174
81-0474
Cyanophos, 81-0468
Diazinon, 81-0747
Dichlorvos, 81-0465, 81-0774
Dicrotophos, 81-0774
Endrin, 81-0232
EPN, 81-0232, 81-0468
Fenitrothion, 81-0232, 81-0468
81-0512, 81-0728
Leptophos, 81-0468
Malathion, 81-0232, 81-0433
81-0781
Mecarbam, 81-0144
Mercarbam, 81-0232
Methyl parathion, 81-0468
81-0486
Mevinphos, 81-0774
Monocrotophos, 81-0774
Organophosphates, 81-0458
81-0683, 81-0728
Paraoxon, 81-0756
Paraquat, 81-0475
Parathion, 81-0232
Thiofanox, 81-0211
Tri-*o*-cresyl phosphate, 81-0468
Trichlorfon, 81-0554
Cytochrome oxidase, 81-0611
Esterases
Acephate, 81-0217
Carbaryl, 81-0232
Dichlorvos, 81-0151
Endrin, 81-0232
EPN, 81-0232
Fenitrothion, 81-0232
Malathion, 81-0232
Paraoxon, 81-0808
Parathion, 81-0232
Pirimiphos-methyloxon, 81-0808
Pyrethrins, 81-0234
Tetrachlorvinphos, 81-0217
Lactic dehydrogenase
Malathion, 81-0247

Enzyme activity (cont'd)
Mixed function oxidases
Aldrin, 81-0764, 81-0772
Chlordane, 81-0772
DDT, 81-0772
Dieldrin, 81-0764, 81-0772
Heptachlor, 81-0772
Herbicides, 81-0772
Lindane, 81-0772
Mirex, 81-0772
Synergists, 81-0772
Toxaphene, 81-0772
Peroxidase
Copper oxychloride, 81-0555
Organochlorines, 81-0555
Organophosphates, 81-0555
Toxicity/experimental organisms
Rat, 81-0249

Enzyme assay
see also Analysis
General
Fungicides, 81-0600
Insecticides, 81-0237, 81-0600
Organochlorines, 81-0237
Organophosphates, 81-0237
Cholinesterase, 81-0273, 81-0566 81-0575, 81-0790
Carbamates, 81-0856, 81-0887
2,4-D, 81-0856
Diazinon, 81-0567
Organophosphates, 81-0887

Excretion
see also Metabolism
Annelids
Carbofuran, 81-0235
Oxamyl, 81-0235
Cow
Mefluidide, 81-0210
Dog
Deet, 81-0531
Repellents, 81-0531
Fish
Lindane, 81-0158
Trichlorobenzenes, 81-0158
Goat
Permethrin, 81-0209
Hamster
Dioxins, 81-0362
Human
Carbaryl, 81-0659
Chlordecone, 81-0659
Paraquat, 81-0793, 81-0795
Thallium, 81-0185
Thallium sulfate, 81-0185
In vitro
2,4-D, 81-0765
DDT, 81-0765
Monkey
Dieldrin, 81-0255
Mouse
Dieldrin, 81-0255
Organomercury fungicides 81-0752
Rabbit
Dieldrin, 81-0255
Rat

Excretion (cont'd)
Dieldrin, 81-0255
Hexachlorobutadiene, 81-0248
Thiofanox, 81-0208
Sheep
Mefluidide, 81-0210

Excretory system
see also Kidney
Animals/experimental
Chlorfenvinphos, 81-0171
Hexachlorobutadiene, 81-0248

Experimental design
General, 81-0001
Analysis, 81-0036, 81-0361, 81-0627 81-0630, 81-0855, 81-0858 81-0866, 81-0888, 81-0898
Aldrin, 81-0877
BHC isomers, 81-0861
Bromophos-ethyl, 81-0861
Carbamates, 81-0685, 81-0864
Carbofuran, 81-0862
Chlordecone, 81-0864, 81-0898
DDE, 81-0862, 81-0864
DDT, 81-0862
Dieldrin, 81-0862
Dimethoate, 81-0861
Endrin, 81-0862
Flurecol-butyl, 81-0861
Heptachlor, 81-0862
Ioxynil, 81-0861
MCPA, 81-0861
Merphos, 81-0862
Methidathion, 81-0864
Methyl parathion, 81-0889
Microbials, 81-0687
Mirex, 81-0864
Organochlorines, 81-0685 81-0877
Organophosphates, 81-0685
Parathion, 81-0862
PCP, 81-0864
Phenoxy acids, 81-0864
Polychlorinated biphenyls 81-0877, 81-0898
TDE, 81-0862
Toxaphene, 81-0862
Epidemiology, prevention, and treatment, 81-0004, 81-0005 81-0125, 81-0126, 81-0127 81-0129, 81-0130, 81-0604 81-0605, 81-0606, 81-0620 81-0627, 81-0630, 81-0631 81-0700, 81-0709, 81-0731 81-0732, 81-0734, 81-0741 81-0836, 81-0896
Carbon tetrachloride, 81-0124
Chlordecone, 81-0124
Dioxins, 81-0124
Herbicides, 81-0051
Organophosphates, 81-0786
Polychlorinated biphenyls 81-0124
2,4,5-T, 81-0024
Monitoring and residues, 81-0004 81-0005, 81-0006, 81-0606 81-0631, 81-0657, 81-0677

Experimental design (cont'd)
Monitoring and residues, 81-0731 81-0732, 81-0734, 81-0896
Carbamates, 81-0643, 81-0728
Chloramben, 81-0876
DDE, 81-0156
DDT, 81-0155
Fumigant insecticides, 81-0880
Lindane, 81-0750
Microbials, 81-0687
Organophosphates, 81-0643 81-0728, 81-0729, 81-0895
PCP, 81-0154
Polychlorinated biphenyls 81-0156
Quintozene, 81-0689
Simazine, 81-0689
Substituted ureas, 81-0643
Toxaphene, 81-0154
Triazine herbicides, 81-0643 81-0895
Trifluralin, 81-0689
Toxicology and pharmacology 81-0006, 81-0008, 81-0062 81-0125, 81-0126, 81-0127 81-0129, 81-0160, 81-0601 81-0603, 81-0604, 81-0606 81-0607, 81-0608, 81-0609 81-0627, 81-0630, 81-0631 81-0740, 81-0741, 81-0765 81-0836, 81-0845, 81-0850
Carbon tetrachloride, 81-0124
Chlordecone, 81-0124
DDE, 81-0156
DDT, 81-0155
Dioxins, 81-0124
Fenitrothion, 81-0784
Fungicides, 81-0055
Herbicides, 81-0055
Insecticides, 81-0055
Organophosphates, 81-0786
Polychlorinated biphenyls 81-0124, 81-0156
Quintozene, 81-0689
Simazine, 81-0689
Temephos, 81-0784
Trifluralin, 81-0689

Eyes
Human
Paraquat, 81-0797

Factors influencing metabolism/toxicity
General, 81-0542
Amitrole, 81-0544
Captan, 81-0787
Carbofuran, 81-0787
Chlorpyrifos, 81-0787
Di-allate, 81-0544
Diazinon, 81-0787
Organochlorines, 81-0544
Polychlorinated biphenyls 81-0544
Adaptation/resistance, 81-0010 81-0041, 81-0320
Acephate, 81-0217
Alachlor, 81-0021
Atrazine, 81-0301

Factors influencing metabolism/toxicity (cont'd)
Benomyl, 81-0037, 81-0193
Butylate, 81-0326
Carbamates, 81-0488, 81-0843
Carbendazim, 81-0193, 81-0788
Chlordimeform, 81-0499
2,4-D, 81-0301
DDT, 81-0039, 81-0243, 81-0619 81-0755
Dicamba, 81-0301
Diflubenzuron, 81-0359
Heavy metals, 81-0159
Herbicides, 81-0353
Insecticides, 81-0359
Lenacil, 81-0301
Methoprene, 81-0359
Organophosphates, 81-0488 81-0529, 81-0843
Parathion, 81-0499
Polychlorinated biphenyls 81-0243
Pyrethrins, 81-0488
Tetrachlorvinphos, 81-0217
Thiabendazole, 81-0193, 81-0788
Thiazoles, 81-0365
Thiophanate-methyl, 81-0193
Trichlorfon, 81-0499
Warfarin, 81-0219
Age
Bacillus thuringiensis, 81-0029
Dichlorvos, 81-0509
Diflubenzuron, 81-0343
Biological magnification, 81-0006
Carbaryl, 81-0175
Chlorfenvinphos, 81-0175
DDE, 81-0156
DDT, 81-0155, 81-0649
Dieldrin, 81-0649
Heavy metals, 81-0161
Hexachlorobenzene, 81-0184
MSMA, 81-0119
Nonachlor, 81-0649
Organomercury fungicides 81-0633
Polychlorinated biphenyls 81-0156, 81-0649
Propoxur, 81-0175
Diet
DDT, 81-0221
Diazinon, 81-0747
Dieldrin, 81-0746
Disease state, 81-0010, 81-0246
Carbaryl, 81-0026
DDT, 81-0198
Isophos-3, 81-0198
Lindane, 81-0198
Malathion, 81-0026
Formulation
Alachlor, 81-0364
Carbaryl, 81-0026
Dioxins, 81-0335
EPTC, 81-0364
Malathion, 81-0026
Nosema locustae, 81-0026
PCP, 81-0526
Thiocarbamate herbicides

Factors influencing metabolism/toxicity (cont'd)
Thiocarbamate herbicides 81-0364
Trifluralin, 81-0364
Vernolate, 81-0364
Geographic location
Asulam, 81-0053
Atrazine, 81-0053
Buthidazole, 81-0053
Cyanazine, 81-0053
2,4-D, 81-0053
Diuron, 81-0053
Hexazinone, 81-0053
Isouron, 81-0053
Interactions, 81-0152, 81-0603 81-0619
Alachlor, 81-0367
Amitrole, 81-0252, 81-0515
Benomyl, 81-0484
Cadmium, 81-0783
Cadmium chloride, 81-0254
Captan, 81-0484
Carbaryl, 81-0026
Carbon tetrachloride, 81-0503
Chlordecone, 81-0503
Chlordimeform, 81-0499
Chlorfenvinphos, 81-0474
2,4-D, 81-0325, 81-0369
Dichlorvos, 81-0151
Diclofop-methyl, 81-0369
Disulfiram, 81-0252
Fungicides, 81-0218
Heavy metals, 81-0161
Herbicides, 81-0311
Hexachlorobenzene, 81-0254 81-0520, 81-0522, 81-0523 81-0524
Insecticides, 81-0218, 81-0237 81-0308, 81-0501
Lindane, 81-0230
Malathion, 81-0026
Mercuric chloride, 81-0254
Microbials, 81-0501
Mirex, 81-0503
Nosema locustae, 81-0026
Organochlorines, 81-0237 81-0783
Organophosphates, 81-0218 81-0237
Oxyfluorofen, 81-0366
Paraquat, 81-0233, 81-0515
Parathion, 81-0499
PCP, 81-0520, 81-0524
Photomirex, 81-0503
Quintozene, 81-0254
Substituted amines, 81-0367
Triallate, 81-0370
Triazine herbicides, 81-0367
Trichlorfon, 81-0499
Warfarin, 81-0533, 81-0540 81-0545
Zineb, 81-0230
Light/radiation
Paraquat, 81-0768
Nutritional state
Dichlorvos, 81-0465

Factors influencing metabolism/toxicity (cont'd)
Dioxins, 81-0226
Hexachlorobenzene, 81-0226
Warfarin, 81-0546
Route
Dioxacarb, 81-0785
Dioxins, 81-0335
Dipyridylphosphate, 81-0698
Organophosphates, 81-0785
Propachlor, 81-0785
Thiram, 81-0785
Sex
Dieldrin, 81-0746
Structure/function
Fenvalerate, 81-0806
Parathion, 81-0760
Substituted aromatic fungicides 81-0807
Taxon
DDT, 81-0758
Paraoxon, 81-0808
Phenoxy acids, 81-0347
Pirimiphos-methyloxon, 81-0808
Pyriminil, 81-0539
Zinc phosphide, 81-0539
Temperature
Propham, 81-0510

Fertility/sterility
see also Reproduction/growth
General
DBCP, 81-0777
Human
DBCP, 81-0514
Dioxins, 81-0695
2,4,5-T, 81-0695

Fibroblasts
see Cytological effects

Gametogenesis
see also Reproduction/growth
Animals/experimental
Trifluralin, 81-0506

Gills
see also Respiratory system
Animals/experimental
Atrazine, 81-0557

Glands
see also Integument
Animals/experimental
Chlordecone, 81-0771
In vitro
Chlordecone, 81-0771

Golgi apparatus
see Cytological effects

Gonads
see Endocrine system

Gravimetry
see Analysis

Growth
see also Reproduction/growth
Animals/experimental, 81-0160 81-0168
BHC, 81-0205

Growth (cont'd)
Carbaryl, 81-0498
Chlorpyrifos, 81-0498
DDT, 81-0221
Deet, 81-0844
Dinocap, 81-0479
Hexachlorobutadiene, 81-0248
Malathion, 81-0498
PCP, 81-0847
Propoxur, 81-0498
Temephos, 81-0498
Zinc phosphide, 81-0518
Microorganisms
Dinoseb acetate, 81-0743
Dodine, 81-0743
Ioxynil, 81-0743
Paraquat, 81-0743
Plants
2,4-D, 81-0558
Nitroanilines, 81-0044
Nitrofen, 81-0558
Terbacil, 81-0558
Uracils, 81-0558

Hair/fur
see Integument

Heart
see also Cardiovascular system
Animals/experimental
Anilate, 81-0194
Chlorbromuron, 81-0194
Pyrazophos, 81-0194

Hemoglobin/hematocrit
Animals/experimental
Chlorfenvinphos, 81-0174

Hormones
see also Endocrine system
General, 81-0470
Carbamates, 81-0740
Organophosphates, 81-0740
Animals/experimental
Dichlorvos, 81-0541
Paraquat, 81-0475

Immunoassay
see also Analysis
81-0868
Bacillus thuringiensis, 81-0565

Immunology
Animals/experimental
Dinoseb, 81-0846
Parathion, 81-0846
Piperonyl butoxide, 81-0846
Pyrethrins, 81-0846
Quintozene, 81-0846
Tri-*o*-cresyl phosphate, 81-0842
Human
Herbicides, 81-0719
Insecticides, 81-0719

Integument
see also Glands; Mucous membranes
Skin
Human
PCP, 81-0693

Kidney
see also Excretory system
Animals/experimental
Amitrole, 81-0515
Fenitrothion, 81-0204, 81-0250
Paraquat, 81-0515
Human
Organophosphates, 81-0134
Paraquat, 81-0793, 81-0794
In vitro
DDT derived compounds
81-0770

Laws and regulations
General, 81-0009, 81-0035, 81-0703
Australia
DBCP, 81-0052
Egypt, 81-0701, 81-0702, 81-0706
France
Organochlorines, 81-0460
Organophosphates, 81-0460
Parathion, 81-0460
Germany (BRD)
Organochlorines, 81-0460
Organophosphates, 81-0460
Parathion, 81-0460
Hungary, 81-0720
Japan
Parathion, 81-0735
Switzerland
Organochlorines, 81-0460
Organophosphates, 81-0460
Parathion, 81-0460
United Kingdom, 81-0322
USA, 81-0123, 81-0137, 81-0139
81-0625, 81-0626, 81-0697
81-0704, 81-0705
Chlordecone, 81-0130
DDT, 81-0130
Dioxins, 81-0130
Organophosphates, 81-0130
Polychlorinated biphenyls
81-0130
USA-DHEW, 81-0699
USA-EPA, 81-0028, 81-0625
81-0626, 81-0627, 81-0694
81-0699, 81-0730
USA-OSHA, 81-0730
USA-California, 81-0730
USA-Colorado, 81-0028
USA-Florida, 81-0028
USA-Nevada, 81-0028
USA-NIOSH
Aldrin, 81-0738
Dieldrin, 81-0738
World Health Organization, 81-0148
81-0705

Lipids/steroids/sterols
see also Biochemical effects
Animals/experimental
DDT, 81-0517
Deet, 81-0844
Dichlorvos, 81-0496
Endrin, 81-0507
Insecticides, 81-0519
Malathion, 81-0507
In vitro

Lipids/steroids/sterols (cont'd)
Carbaryl, 81-0232
EPN, 81-0232
Fenitrothion, 81-0232
Malathion, 81-0232
Paraquat, 81-0495
Parathion, 81-0232
Plants
Herbicides, 81-0018

Liver
see also Digestive system
General
Carbon tetrachloride, 81-0179
Mercuric chloride, 81-0179
Animals/experimental
Aldrin, 81-0186
Amitrole, 81-0249, 81-0515
BHC, 81-0205
Carbon tetrachloride, 81-0502
81-0503
Chlordecone, 81-0503
Chlorthiamid, 81-0245
Dieldrin, 81-0186, 81-0502
Diethyldithiocarbamic acid
81-0249
Dioxins, 81-0226
Disulfiram, 81-0249
Fenitrothion, 81-0204, 81-0250
Hexachlorobenzene, 81-0226
Lindane, 81-0230
Mirex, 81-0216, 81-0502, 81-0503
Nitrofen, 81-0215
Paraquat, 81-0515
PCP, 81-0847
Photomirex, 81-0503
PMA, 81-0240
Polychlorinated biphenyls
81-0502
Pronamide, 81-0197
Tin trimethylchloride, 81-0167
Zineb, 81-0230
Human
Hexachlorobenzene, 81-0239
Organochlorines, 81-0835
Paraquat, 81-0744, 81-0794
In vitro
Amitrole, 81-0252
Disulfiram, 81-0252
Hydroprene, 81-0195
Methoprene, 81-0195
Parathion, 81-0223

Lung
see also Respiratory system
General, 81-0601
Animals/experimental
Amitrole, 81-0515
ANTU, 81-0187
Bioresmethrin, 81-0537
Cismethrin, 81-0537
Nitrofen, 81-0215
Paraquat, 81-0187, 81-0511
81-0515, 81-0550
Human
Paraquat, 81-0793, 81-0794
Rodenticides, 81-0491
Sodium fluoride, 81-0491

Lung (cont'd)
In vitro
Diquat, 81-0742
Paraquat, 81-0467, 81-0742

Lymph
see Body fluids

Lysosomes
see Cytological effects

Marrow
Animals/experimental
Dioxins, 81-0613
Human
Insecticides, 81-0169
Lindane, 81-0464

Metabolism
see also Biotransformation; Excretion
General, 81-0603
Carbamates, 81-0740
Dichlorvos, 81-0172
Hexachlorobenzene, 81-0513
Organophosphates, 81-0740
Parathion, 81-0760
Annelids
Oxamyl, 81-0235
Crops
Triadimefon, 81-0056
Goat
Permethrin, 81-0209
Hamster
Phenothiazine, 81-0492
In vitro
Atrazine, 81-0207
Benazolin, 81-0046
BHC isomers, 81-0232
Bromacil, 81-0046
Carbaryl, 81-0232
Chlorpropham, 81-0046
2,4-D, 81-0046
Dichlobenil, 81-0046
Dinoseb, 81-0046
Diphenamid, 81-0046
Endrin, 81-0232
EPN, 81-0232
Fenitrothion, 81-0232
Hydroprene, 81-0195
Hydroxyatrazine, 81-0046
Malathion, 81-0232
Mercarbam, 81-0232
Methoprene, 81-0195
Methoxychlor, 81-0224
Parathion, 81-0223, 81-0232
Insects
BHC isomers, 81-0754
Lindane, 81-0754
Pyrethrins, 81-0234
Mammals, 81-0611
BHC isomers, 81-0754
Lindane, 81-0754
Pyrethrins, 81-0234
Microorganisms
Chloridazon, 81-0200
Organophosphates, 81-0652
Monkey
Dieldrin, 81-0255

Metabolism (cont'd)
Mouse
Dieldrin, 81-0255
Lindane, 81-0230
Phenothiazine, 81-0492
Zineb, 81-0230
Plankton/algae
Buthidazole, 81-0088
Prometryne, 81-0089
Quintozene, 81-0086
Plants
Chlormequat chloride, 81-0641
81-0642
Dialene, 81-0642
Diclofop-methyl, 81-0034
81-0369
Herbicides, 81-0353
Permethrin, 81-0108
Thiazoles, 81-0365
Quail
Dieldrin, 81-0746
Rabbit
Dieldrin, 81-0255
Rat
DDT, 81-0221
Dieldrin, 81-0255
Hexachlorobutadiene, 81-0248
Lindane, 81-0230
Malathion, 81-0247
Methoxychlor, 81-0224
Mirex, 81-0216
Paraquat, 81-0511
Phenothiazine, 81-0492
PMA, 81-0240
Quintozene, 81-0253
Thiofanox, 81-0208
Warfarin, 81-0225, 81-0549
Zineb, 81-0230

Microsomes
see also Cytological effects
In vitro
Carbofuran, 81-0753
DDE, 81-0500
DDT, 81-0500

Microtubules
see also Cytological effects
In vitro
Propham, 81-0510
Microorganisms
Carbendazim, 81-0212, 81-0767

Mitochondria
see also Cytological effects
Animals/experimental
Phosphamidon, 81-0477
Cytological effects
DBCP, 81-0165
Fentrifanil, 81-0164
In vitro
Carbaryl, 81-0471
Chlorfenvinphos, 81-0471
2,4-D, 81-0472
DDE, 81-0500
DDT, 81-0500
Paraquat, 81-0472
Rotenone, 81-0466
Plants

Mitochondria (cont'd)
DDE, 81-0478
DDT, 81-0478

Mitosis/meiosis
see also Cytological effects
Animals/experimental
Methylmercuric chloride, 81-0244
In vitro
Ethylene dibromide, 81-0490
Propham, 81-0510
Microorganisms
Carbendazim, 81-0767
Fungicides, 81-0229
Plants
Carboxin, 81-0189, 81-0190
Leptophos, 81-0191
Mancozeb, 81-0189, 81-0190

Models
Analysis
Herbicides, 81-0306
Insecticides, 81-0306
Computer
Aldicarb, 81-0111
Oxamyl, 81-0110
Environmental, 81-0014, 81-0065
81-0077, 81-0435, 81-0606
Chlorpyrifos, 81-0064
DDT, 81-0063, 81-0064
Dioctyl phthalate, 81-0064
Hexachlorobenzene, 81-0064
Methoxychlor, 81-0063
Methyl parathion, 81-0063
81-0486
Paraquat, 81-0063
PCP, 81-0063, 81-0064
Quintozene, 81-0689
Simazine, 81-0689
Toxaphene, 81-0063
Trifluralin, 81-0689
Mathematical, 81-0065
Carbamate herbicides, 81-0069
Carbamates, 81-0069
Chlordecone, 81-0075
Chlorpyrifos, 81-0410
Dinitramine, 81-0442
Nitroanilines, 81-0069
Organochlorines, 81-0069
Organophosphates, 81-0069
Substituted ureas, 81-0069
Triazine herbicides, 81-0069
Pharmacology
Ethylene thiourea, 81-0761

Monitoring devices/programs
General, 81-0066, 81-0067, 81-0068
81-0077, 81-0401
Carbamates, 81-0887
Carbaryl, 81-0659
Chlordecone, 81-0659
2,4-D, 81-0871
Diazinon, 81-0667
Nitroanilines, 81-0887
Organochlorines, 81-0887
Organophosphates, 81-0887
Phenoxy acids, 81-0887
Phosmet, 81-0667
Polychlorinated biphenyls

Monitoring devices/programs (cont'd)
Polychlorinated biphenyls 81-0007
Air
Carbamates, 81-0685
Organochlorines, 81-0685
Organophosphates, 81-0685
Ecosystems, 81-0062
Chlordane, 81-0070
Chlordecone, 81-0070
DDT, 81-0070
Dieldrin, 81-0070
Lindane, 81-0070
Water, 81-0405
Carbaryl, 81-0684
Carbofuran, 81-0684
Copper sulfate, 81-0438
Demeton, 81-0684
Dichlorvos, 81-0684
Fenamiphos, 81-0684
Fenthion, 81-0684
Methiocarb, 81-0684

Morbidity and mortality statistics
General, 81-0027
Australia
Herbicides, 81-0051
Bulgaria, 81-0132
Fundazol, 81-0133
Czechoslovakia
Dioxins, 81-0049
Egypt
Azinphosmethyl, 81-0706
Leptophos, 81-0706
Methamidophos, 81-0706
Methomyl, 81-0706
Germany (BRD)
Dioxins, 81-0149
Organic arsenicals, 81-0149
Germany (DDR)
BHC, 81-0719
DDT, 81-0719
DNOC, 81-0719
Organomercury fungicides 81-0719
Organophosphates, 81-0719
Phosphine, 81-0719
Hungary
Carbamates, 81-0710
Fumigants, 81-0710
Fungicides, 81-0710
Herbicides, 81-0710
Mevinphos, 81-0710
Nicotine, 81-0710
Organochlorines, 81-0710
Organophosphates, 81-0710
Rodenticides, 81-0710
Italy
Organophosphates, 81-0134
Japan, 81-0143, 81-0145
Mecarbam, 81-0144
Paraquat, 81-0146
Kenya
Organophosphates, 81-0696
USA, 81-0622, 81-0727
DBCP, 81-0141
Dialifor, 81-0087
Dioxins, 81-0722

Morbidity and mortality statistics (cont'd)
2,4,5-T, 81-0722
USA-Illinois
Organochlorines, 81-0147
USA-Michigan
DBCP, 81-0454
Dioxins, 81-0695
2,4,5-T, 81-0695
USA-Tennessee
Bifenox, 81-0736
Ethoprop, 81-0736
Merphos, 81-0736
USSR
BHC, 81-0136
Methyl parathion, 81-0136
Vietnam
Herbicides, 81-0051
World Health Organization
Carbamates, 81-0728
Organophosphates, 81-0728

Mucous membranes
see also Integument
Human
Paraquat, 81-0795

Muscle, smooth
Animals/experimental
Chlorfenvinphos, 81-0474
Rotenone, 81-0214

Muscle, striated
Animals/experimental
DDT, 81-0188

Musculoskeletal system
Animals/experimental
DFP, 81-0532
Human
Mevinphos, 81-0803

Mutagenesis
General, 81-0601, 81-0607, 81-0608
Acephate, 81-0776
Benomyl, 81-0778
Bromacil, 81-0776
Cacodylic acid, 81-0776
Captan, 81-0776
Demeton, 81-0776
Di-allate, 81-0778
Dichlorvos, 81-0172
Dioxins, 81-0777
Folpet, 81-0776
Maleic hydrazide, 81-0778
Monocrotophos, 81-0776
Monuron, 81-0778
Organophosphates, 81-0777
Rotenone, 81-0778
Simazine, 81-0776
Triallate, 81-0778
Trichlorfon, 81-0776
Animals/experimental
Benomyl, 81-0251
Captan, 81-0451
2,4-D, 81-0199
Dimethoate, 81-0199
Diquat, 81-0482
Ethylene dibromide, 81-0751
Ethylene oxide, 81-0535

Mutagenesis (cont'd)
Methyl parathion, 81-0199
Molinate, 81-0199
Paraquat, 81-0482
Phosmet, 81-0199
Phoxim, 81-0199
Thiram, 81-0199
Trichlorfon, 81-0199
Trifluralin, 81-0506
Ziram, 81-0199
In vitro
Atrazine, 81-0749
Benomyl, 81-0251
Heavy metals, 81-0834
Microorganisms, 81-0166
DBCP, 81-0740
Ethylene dibromide, 81-0740 81-0751

Nervous system
see also Behavior; Brain; EEG; Polyneuritis
Animals/experimental
BHC, 81-0203, 81-0213
Chlordimeform, 81-0759
Copper oxychloride, 81-0203
Copper sulfate, 81-0203
Cyanofenphos, 81-0798
DDT, 81-0203
DFP, 81-0532
Endosulfan, 81-0203
Leptophos, 81-0483, 81-0792 81-0799
MEMC, 81-0203
Mercuric chloride, 81-0203
Mirex, 81-0480
PMA, 81-0203
Brain
Phosphamidon, 81-0177, 81-0178
Human
BPMC, 81-0796
Carbamates, 81-0228
Chlordecone, 81-0123
DDT, 81-0196
Diquat, 81-0228
Edifenphos, 81-0796
Fenthion, 81-0796
Mevinphos, 81-0803
Organophosphates, 81-0228
Paraquat, 81-0228
Parathion, 81-0228
Thallium, 81-0196
In vitro
DFP, 81-0551, 81-0769
Dicrotophos, 81-0769
Organochlorines, 81-0551
Paraoxon, 81-0551

Nomenclature, 81-0629, 81-0657

Nucleic acids
see also Biochemical effects
Animals/experimental
Carbon tetrachloride, 81-0502
Dieldrin, 81-0502
Mirex, 81-0502
Polychlorinated biphenyls 81-0502
Trichlorfon, 81-0554

Nucleic acids (cont'd)
Human
DBCP, 81-0514
In vitro
Ethylene dibromide, 81-0490
Plants
Malathion, 81-0336

Pancreas (exocrine)
see also Digestive system
Human
Pyriminil, 81-0497

Phagocytes
Animals/experimental
Dioxins, 81-0613

Photodecomposition
see also Residue degradation 81-0660
3,4-Dichloroaniline, 81-0084
Insecticides, 81-0390
Isoprothiolane, 81-0372
Pyrethrins, 81-0099
Quinomethionate, 81-0670
Substituted aromatic herbicides 81-0096

Phytotoxicity
see also Toxicity/non-target organisms
General
Carbaryl, 81-0175
Carboxin, 81-0189, 81-0190
Chlorfenvinphos, 81-0175
Chlortoluron, 81-0198
Fungicides, 81-0218
Mancozeb, 81-0189, 81-0190
Propoxur, 81-0175
Simazine, 81-0198
Aquatics
Copper sulfate, 81-0438
2,4-D, 81-0558
Nitrofen, 81-0558
Terbacil, 81-0558
Uracils, 81-0558
Crops
Acetaldehyde, 81-0617
Alachlor, 81-0021, 81-0367 81-0656
Asulam, 81-0053
Atrazine, 81-0053, 81-0301
Buthidazole, 81-0053
Butylate, 81-0326
Carbendazim, 81-0082
Chlorflurecol, 81-0050
Chlormequat chloride, 81-0641 81-0642
Chloropicrin, 81-0655
Copper oxychloride, 81-0309
Cyanazine, 81-0053
1,3-D, 81-0655
2,4-D, 81-0053, 81-0301, 81-0321
DDE, 81-0478
DDT, 81-0478
Dialene, 81-0642
Dicamba, 81-0301
Diclofop-methyl, 81-0034
Dinoseb, 81-0023

Phytotoxicity (cont'd)
Diuron, 81-0053
Ethyl formate, 81-0617
Ethylmercuric chloride, 81-0309
Fenapanil, 81-0025
Gibberellic acid, 81-0616
Glyphosate, 81-0016
Herbicides, 81-0018, 81-0311
Hexazinone, 81-0053
Isouron, 81-0053
Lenacil, 81-0301
MCPA, 81-0321
Oxyfluorofen, 81-0366
Phenoxy acids, 81-0017, 81-0019
Substituted amines, 81-0367
Substituted aromatic fungicides 81-0045
Substituted ureas, 81-0017 81-0019
Thiram, 81-0309
Triallate, 81-0370
Triazine herbicides, 81-0017 81-0019
Zineb, 81-0309
Forest
Herbicides, 81-0302
Tobacco
Maleic anhydride, 81-0305
Trees/shrubs
Dikegulac, 81-0318
Ethephon, 81-0031
Herbicides, 81-0302
Paraquat, 81-0632
Terbacil, 81-0425

Placental transfer
see also Reproduction/growth
Animals/experimental
Dithiocarbamates, 81-0199
Human
Warfarin, 81-0766

Plasma/serum
General
Carbon tetrachloride, 81-0179
Mercuric chloride, 81-0179
Animals/experimental
PMA, 81-0173

Polyneuritis
see also Nervous system
Animals/experimental
Carbamates, 81-0775
Cyanofenphos, 81-0798
EPN, 81-0775
Mipafox, 81-0775
Organophosphates, 81-0809
Parathion, 81-0775
Tri-*o*-cresyl phosphate, 81-0842
Trichlorfon, 81-0775
Human
Carbamates, 81-0775
EPN, 81-0775
Mipafox, 81-0775
Organophosphates, 81-0809
Parathion, 81-0775
Trichlorfon, 81-0775

Porphyrins/pigments
see also Biochemical effects
Animals/experimental
Dioxins, 81-0338
Heptachlor, 81-0525
Hexachlorobenzene, 81-0239 81-0520, 81-0521, 81-0522
Lindane, 81-0525
PCP, 81-0520, 81-0526
Warfarin, 81-0225
Biochemical effects
DBCP, 81-0165
Human
Dioxins, 81-0337
Hexachlorobenzene, 81-0239
2,4,5-T, 81-0239
In vitro
Amitrole, 81-0252
Disulfiram, 81-0252
Hexachlorobenzene, 81-0523 81-0524
Paraquat, 81-0853
Parathion, 81-0223
PCP, 81-0524

Prevention
General, 81-0003, 81-0067, 81-0603 81-0630, 81-0677, 81-0699 81-0700, 81-0701, 81-0702 81-0706, 81-0707, 81-0734
DBCP, 81-0052
Ethylene dichloride, 81-0713
Hydrogen cyanide, 81-0713
Methyl bromide, 81-0713
Phosphine, 81-0713
Propachlor, 81-0712
Decontamination
Atrazine, 81-0737
2,4-D, 81-0448
DDT, 81-0448, 81-0456
Dioxins, 81-0129, 81-0330 81-0331
Dithiocarbamates, 81-0129
Ethylene thiourea, 81-0129
Maneb, 81-0737
MCPA, 81-0459
MSMA, 81-0737
Organophosphates, 81-0303
Oryzalin, 81-0737
Parathion, 81-0456
PCP, 81-0129
Sarin, 81-0303
Soman, 81-0303
2,4,5-T, 81-0129
Disposal, 81-0138, 81-0625, 81-0626 81-0634, 81-0714, 81-0718 81-0723, 81-0724, 81-0725
BHC, 81-0461
Chlordecone, 81-0137
DBCP, 81-0137
Demephion, 81-0717
Demeton-*S*-methyl, 81-0717
Dimethoate, 81-0717
Dinoseb, 81-0717
Dioxins, 81-0137
DNOC, 81-0717
Fungicides, 81-0624
Herbicides, 81-0624

Prevention (cont'd)
Insecticides, 81-0624
Oxyquinoline sulfate, 81-0717
Phorate, 81-0717
Phosphamidon, 81-0717
Polychlorinated biphenyls 81-0461
Pronamide, 81-0142
Rodenticides, 81-0624
Education/training, 81-0123, 81-0697
Protective equipment, 81-0001 81-0716, 81-0732
Bifenox, 81-0736
Chlorpropham, 81-0733
Chlorpyrifos, 81-0733
Dichlorvos, 81-0715
Dimethoate, 81-0707
Dinoseb, 81-0733
Ethoprop, 81-0736
Ethylene dibromide, 81-0453
Merphos, 81-0736
PCP, 81-0733
Protective practices, 81-0042 81-0129, 81-0130, 81-0322 81-0447, 81-0621, 81-0688 81-0718, 81-0720, 81-0836
Atrazine, 81-0711
Herbicides, 81-0711
Substituted amines, 81-0128
TCPE, 81-0711
Storage and transportation, 81-0714

Reproduction cycle
see also Reproduction/growth
Animals/experimental
2,4-D, 81-0534
Endrin, 81-0507
Malathion, 81-0507
Organochlorines, 81-0493
Picloram, 81-0534

Reproduction/growth
see also Embryo/fetus; Fertility/sterility; Gametogenesis; Growth; Placental transfer; Reproduction cycle; Reproductive organs and hormones, male; Teratogenesis
Animals/experimental
BHC, 81-0203
Copper oxychloride, 81-0203
Copper sulfate, 81-0203
DDT, 81-0203, 81-0802
3,4-Dichloroaniline, 81-0505
Dieldrin, 81-0505
Diflubenzuron, 81-0163
Dinocap, 81-0479
Endosulfan, 81-0203
Fenitrothion, 81-0784
Hexachlorobenzene, 81-0513
MEMC, 81-0203
Mercuric chloride, 81-0203
PCP, 81-0505
PMA, 81-0203
Polychlorinated biphenyls 81-0748
Temephos, 81-0784
Human

Reproduction/growth (cont'd)
Dioxins, 81-0695
2,4,5-T, 81-0695
Plants
Fenitrothion, 81-0020

Reproductive organs and hormones, female
see Reproduction/growth

Reproductive organs and hormones, male
see also Reproduction/growth
Animals/experimental
DBCP, 81-0839
Human
DBCP, 81-0141, 81-0454, 81-0514

Residue degradation
see also Biotransformation; Photodecomposition
General, 81-0428, 81-0657
Carbamates, 81-0887
DDT, 81-0456
Dialifor, 81-0087
Herbicides, 81-0430
Insecticides, 81-0430
Nitroanilines, 81-0887
Organochlorines, 81-0887
Organophosphates, 81-0391 81-0887
Parathion, 81-0456
Phenoxy acids, 81-0887
Ecosystems, 81-0063, 81-0690
PCP, 81-0064
Food and feed
Dinocap, 81-0383
In vitro
Carboxin, 81-0389, 81-0408
2,4-D, 81-0448
DDT, 81-0448, 81-0469
Oxathiines, 81-0389
Oxycarboxin, 81-0389, 81-0408
Plants
Diazinon, 81-0385
Soil, 81-0660
Alachlor, 81-0656
Aldicarb, 81-0109, 81-0111
Aldrin, 81-0080, 81-0678
Atrazine, 81-0371, 81-0644 81-0660
Barban, 81-0398
Carbamate herbicides, 81-0388
Carbamates, 81-0388
Carbofuran, 81-0093, 81-0094
4-Chloroaniline, 81-0398
Chlorpropham, 81-0648
Chlortoluron, 81-0648
2,4-D, 81-0403
Dacthal, 81-0102
DDT, 81-0678
Dieldrin, 81-0080
Dinitramine, 81-0442
Endosulfan, 81-0090
Endrin, 81-0080
FMC-31768, 81-0094
FMC-35001, 81-0093
Heptachlor, 81-0678
IBP, 81-0654

Residue degradation (cont'd)
Isoproturon, 81-0648
Linuron, 81-0102, 81-0103
MCPA, 81-0266
Molinate, 81-0083, 81-0407
Nitrogen heterocyclic herbicides 81-0674
p-Nitrophenol, 81-0061
Organophosphates, 81-0388 81-0674
Oxamyl, 81-0109, 81-0110
Oxydemeton methyl, 81-0091
Paraoxon, 81-0097
Parathion, 81-0061, 81-0097
PCP, 81-0434
Picloram, 81-0373
Profluralin, 81-0406
Prometryne, 81-0102, 81-0103
Propachlor, 81-0102
Substituted amines, 81-0076
Substituted ureas, 81-0388
2,4,5-T, 81-0678
Trichlorophenol, 81-0434
Trifluralin, 81-0102, 81-0406
Water
Aldrin, 81-0678
Carbamate herbicides, 81-0388
Carbamates, 81-0388
Carbaryl, 81-0175, 81-0650
Chlorfenvinphos, 81-0175
Chlorpyrifos, 81-0410
2,4-D, 81-0440, 81-0441
DDT, 81-0678
Heptachlor, 81-0678
IBP, 81-0654
Malathion, 81-0433
MCPA, 81-0459
p-Nitrophenol, 81-0061
Organophosphates, 81-0388
Parathion, 81-0061
Polychlorinated biphenyls 81-0393
Propoxur, 81-0175
Substituted ureas, 81-0388
2,4,5-T, 81-0678

Residue dynamics, 81-0065, 81-0068 81-0690, 81-0783
Atrazine, 81-0673
Benomyl, 81-0115
Carbamate herbicides, 81-0069
Carbamates, 81-0069
Chlorothalonil, 81-0115
Cyanazine, 81-0673
DDT, 81-0064
Dialifor, 81-0087
Diazinon, 81-0115, 81-0385
Dicofol, 81-0115
Dinocap, 81-0383
Dioctyl phthalate, 81-0064
Dithiocarbamates, 81-0115
Hexachlorobenzene, 81-0064
Mevinphos, 81-0115
MSMA, 81-0119
Nitroanilines, 81-0069
Organochlorines, 81-0069, 81-0640
Organophosphates, 81-0069
Parathion, 81-0115

Residue dynamics (cont'd)
PCP, 81-0064, 81-0073
Picloram, 81-0373
Pyrazophos, 81-0115
Quinomethionate, 81-0115
Substituted ureas, 81-0069
Triazine herbicides, 81-0069

Residue removal
Ecosystems, 81-0435
Food and feed
Carbaryl, 81-0104, 81-0671
Chlorfenvinphos, 81-0072
Dichlorvos, 81-0104
Endosulfan, 81-0426
Fenitrothion, 81-0426, 81-0671
Malathion, 81-0426
Methyl parathion, 81-0426
Oxydemeton methyl, 81-0113
Phenothrin, 81-0671
Phosalone, 81-0104
Pirimiphos-methyl, 81-0671
Plants
Acephate, 81-0681
Maleic hydrazide, 81-0681
Methomyl, 81-0681
Monocrotophos, 81-0681
Soil
Dioxins, 81-0331
Water
Atrazine, 81-0737
Maneb, 81-0737
MSMA, 81-0737
Oryzalin, 81-0737

Residues/air
Agricultural, 81-0106, 81-0396
Carbofuran, 81-0862
DDE, 81-0862
DDT, 81-0862
DEF, 81-0397
Dieldrin, 81-0862
Endrin, 81-0862
Fenitrothion, 81-0107
Heptachlor, 81-0862
Maneb, 81-0664
Merphos, 81-0862
Parathion, 81-0862
TDE, 81-0862
Toxaphene, 81-0862
Industrial, 81-0621, 81-0631
Atrazine, 81-0711
Carbon tetrachloride, 81-0688
Ethylene dibromide, 81-0453
Ethylene dichloride, 81-0688
Herbicides, 81-0711
Methiocarb, 81-0651
Methyl bromide, 81-0688
Substituted amines, 81-0128
Sulfur dioxide, 81-0688
TCPE, 81-0711
Rural, 81-0106
BHC isomers, 81-0679
Chlordane, 81-0679
DDT, 81-0679
Dieldrin, 81-0679
Dioxins, 81-0333
Fenitrothion, 81-0107

Residues/air (cont'd)
Hexachlorobenzene, 81-0679
Polychlorinated biphenyls 81-0679

Residues/food and feed
General, 81-0042, 81-0382
Chlorfenvinphos, 81-0072
Fumigants, 81-0377
Polychlorinated biphenyls 81-0634
Total diet
BHC, 81-0665
Carbamate herbicides, 81-0100
Carbamates, 81-0100
DDT, 81-0665
Dieldrin, 81-0665
Dithiocarbamates, 81-0665
Heptachlor, 81-0665
Heptachlor epoxide, 81-0665
Hexachlorobenzene, 81-0665
Nitroanilines, 81-0100
Organochlorines, 81-0100
Organophosphates, 81-0100
Quintozene, 81-0665
Animal feed
Bromoxynil, 81-0271
2,4-D, 81-0271
Cereals
Bromoxynil, 81-0271
2,4-D, 81-0271
Endosulfan, 81-0426
Fenitrothion, 81-0426
IBP, 81-0654
Malathion, 81-0426
Methyl parathion, 81-0426
Nitrofen, 81-0658
Polychlorinated biphenyls 81-0635
Dairy products
Chlorfenvinphos, 81-0072
Organochlorines, 81-0374
Fish
DDE, 81-0661
DDT, 81-0118, 81-0661
DDT derived compounds 81-0118
Hexachlorobenzene, 81-0118
Polychlorinated biphenyls 81-0007, 81-0118
TDE, 81-0661
Fruits
Azinphosmethyl, 81-0414
Benomyl, 81-0414
Daminozide, 81-0423
Phosmet, 81-0414
Zineb, 81-0081
Meat, 81-0634
BHC, 81-0374
DDE, 81-0682
DDT, 81-0118, 81-0374
DDT derived compounds 81-0118
DDT isomers, 81-0682
Dieldrin, 81-0374, 81-0682
Endrin, 81-0682
Hexachlorobenzene, 81-0118
Polychlorinated biphenyls

Residues/food and feed (cont'd)
Polychlorinated biphenyls 81-0118
TDE, 81-0682
Poultry
DDT, 81-0118
DDT derived compounds 81-0118
Hexachlorobenzene, 81-0118
Polychlorinated biphenyls 81-0118
Vegetables
Alachlor, 81-0656
Aldicarb, 81-0140, 81-0672 81-0676
Aldrin, 81-0078, 81-0079
Benomyl, 81-0115
Cartap, 81-0071
Chlorothalonil, 81-0115
Diazinon, 81-0115
Dicofol, 81-0115
Dieldrin, 81-0078, 81-0079
Dithiocarbamates, 81-0115
Endrin, 81-0079
Fensulfothion, 81-0285
Hexachlorobenzene, 81-0117
Lindane, 81-0071
Linuron, 81-0103
Maleic hydrazide, 81-0098
Metazine, 81-0135
Mevinphos, 81-0115
Nitrapyrin, 81-0101
Organochlorines, 81-0117
Oxycarboxin, 81-0115
Oxydemeton methyl, 81-0113 81-0676
Parathion, 81-0115
Phorate, 81-0424, 81-0676
Prometryne, 81-0103
Pyrazophos, 81-0115
Quinomethionate, 81-0115

Residues/humans
General
Carbamates, 81-0683
Dioxins, 81-0722
Organophosphates, 81-0683
2,4,5-T, 81-0722
Adipose
BHC, 81-0378
DDE, 81-0378
DDT, 81-0378, 81-0702
Leptophos, 81-0702
Lindane, 81-0702
Organochlorines, 81-0668
Blood
BHC, 81-0669
Chlorpyrifos, 81-0691
DDE, 81-0669
DDT, 81-0669
Dicrotophos, 81-0691
Edifenphos, 81-0666
Fenthion, 81-0666
Malathion, 81-0691
Parathion, 81-0691
Milk
Chlordane, 81-0386
Dioxins, 81-0602

Residues/humans (cont'd)
Nonachlor, 81-0386
Organochlorines, 81-0668
Oxychlordane, 81-0386
Organs
Chlorpyrifos, 81-0691
Dicrotophos, 81-0691
Malathion, 81-0691
Organochlorines, 81-0668
Parathion, 81-0691
Urine
Chlorpyrifos, 81-0691
Dicrotophos, 81-0691
Edifenphos, 81-0666
Fenthion, 81-0666
Malathion, 81-0691
Parathion, 81-0691

Residues/non-target organisms
General
Dioxins, 81-0722
Organochlorines, 81-0323
2,4,5-T, 81-0722
Annelids
DDT, 81-0399
Dieldrin, 81-0399
Heptachlor, 81-0399
Birds, 81-0384
DDE, 81-0395, 81-0528, 81-0748
Dieldrin, 81-0748
Organochlorines, 81-0419
Polychlorinated biphenyls 81-0395, 81-0419, 81-0528
Cow
BHC, 81-0409
DDT, 81-0409
PCP, 81-0571
Crustacea
Aldrin, 81-0412
DDT, 81-0412
Dieldrin, 81-0412
Polychlorinated biphenyls 81-0412
Duck
DDE, 81-0418, 81-0647
DDT, 81-0418, 81-0647
Dieldrin, 81-0418
Heptachlor epoxide, 81-0418
Organophosphates, 81-0647
Oxychlordane, 81-0418
Polychlorinated biphenyls 81-0418
TDE, 81-0418
Eggs
DDE, 81-0395, 81-0418, 81-0528
DDT, 81-0418
Dieldrin, 81-0418
Heptachlor epoxide, 81-0418
Oxychlordane, 81-0418
Polychlorinated biphenyls 81-0395, 81-0418, 81-0528
TDE, 81-0418
Fish
Carbaryl, 81-0175
Chlorfenvinphos, 81-0175
DDE, 81-0416, 81-0645, 81-0661
DDT, 81-0416, 81-0661
DDT isomers, 81-0416

Residues/non-target organisms (cont'd)
Hexachlorobenzene, 81-0645
Malathion, 81-0433
PCP, 81-0073
Polychlorinated biphenyls 81-0007, 81-0416, 81-0645
Propoxur, 81-0175
TDE, 81-0661
Invertebrates
DDE, 81-0645
Hexachlorobenzene, 81-0645
Polychlorinated biphenyls 81-0645
Microorganisms
PCP, 81-0073
Molluscs
Aldrin, 81-0412
Carbaryl, 81-0175
Chlorfenvinphos, 81-0175
DDE, 81-0415
DDT, 81-0412, 81-0417
Dieldrin, 81-0412
Hexachlorobenzene, 81-0387
Lindane, 81-0415
Methyl parathion, 81-0417
Organochlorines, 81-0415
PCP, 81-0387
Polychlorinated biphenyls 81-0412
Propoxur, 81-0175
TDE, 81-0417
Toxaphene, 81-0417
Mouse
Chlordecone, 81-0394
Pheasant, 81-0384
Plankton/algae
Carbaryl, 81-0175
Chlorfenvinphos, 81-0175
Propoxur, 81-0175
Reptiles
DDE, 81-0413
DDT, 81-0413, 81-0649
Dieldrin, 81-0413, 81-0649
Nonachlor, 81-0649
Polychlorinated biphenyls 81-0413, 81-0649

Residues/plants
General, 81-0631
DDT, 81-0121
Lindane, 81-0121
Phosalone, 81-0122
Crops
Acephate, 81-0681
Alachlor, 81-0364
Aldicarb, 81-0672
Captan, 81-0114, 81-0444
Carbofuran, 81-0429
Chlorothalonil, 81-0444
DDT, 81-0429, 81-0431
Dialifor, 81-0087
Diazinon, 81-0385
Dieldrin, 81-0431
Endosulfan, 81-0426, 81-0431
EPTC, 81-0364
Fenitrothion, 81-0426
Insecticides, 81-0446
Malathion, 81-0426

Residues/plants (cont'd)
Maleic hydrazide, 81-0681
Methidathion, 81-0095
Methomyl, 81-0681
Methyl parathion, 81-0426 81-0429
Monocrotophos, 81-0681
Organophosphates, 81-0431 81-0446
Parathion, 81-0429
Permethrin, 81-0446
Phorate, 81-0400, 81-0424
Terbuphos, 81-0400
Thiocarbamate herbicides 81-0364
Trifluralin, 81-0364
Vernolate, 81-0364
Zineb, 81-0114
Herbs, medicinals/condiments
BHC, 81-0057, 81-0058
Carbendazim, 81-0059
DDT, 81-0058
DDT derived compounds 81-0057
DDT isomers, 81-0057
Desmetryne, 81-0116
Herbicides, 81-0445
Methoxychlor, 81-0057, 81-0058
Prometryne, 81-0116
Quintozene, 81-0059
Simazine, 81-0116
Tobacco
Aldrin, 81-0381
BHC, 81-0381
DDT, 81-0431
DDT isomers, 81-0379, 81-0381
Dieldrin, 81-0381, 81-0431
Disulfoton, 81-0380
Endosulfan, 81-0381, 81-0431
Endrin, 81-0381
Ethoprop, 81-0380
Lindane, 81-0381
Maleic hydrazide, 81-0379
Organochlorines, 81-0379 81-0381
Organophosphates, 81-0379 81-0431
Trees/shrubs
Carbendazim, 81-0421

Residues/soil
General, 81-0631
Asulam, 81-0120
BHC, 81-0662
Chloropicrin, 81-0655
1,3-D, 81-0655
Dacthal, 81-0102
DDT, 81-0121
Dioxins, 81-0329
Herbicides, 81-0074, 81-0120
Lindane, 81-0121
Linuron, 81-0102
Metazine, 81-0135
Nitroanilines, 81-0074
Paraquat, 81-0074
Prometryne, 81-0102
Propachlor, 81-0102
Terbacil, 81-0425

Residues/soil (cont'd)
Trifluralin, 81-0102
Adsorption, 81-0375, 81-0376
Alachlor, 81-0656
Aldrin, 81-0646
Carbaryl, 81-0646
Carbendazim, 81-0059
Chlordecone, 81-0075, 81-0439
4-Chloroaniline, 81-0392
2,4-D, 81-0403
DDT, 81-0439, 81-0646, 81-0660 81-0692
Dicofol, 81-0692
Dieldrin, 81-0439
Diflubenzuron, 81-0439
Dioxins, 81-0331
Diquat, 81-0660
Fenuron, 81-0680
Heptachlor, 81-0439
Lindane, 81-0646, 81-0692
Malathion, 81-0646
Methoprotryne, 81-0680
Monuron, 81-0680
Organic arsenicals, 81-0105
Paraquat, 81-0660
Parathion, 81-0646
Picloram, 81-0060
Profluralin, 81-0658
Prometone, 81-0680
Quintozene, 81-0059
Movement, 81-0686
Aldicarb, 81-0111
Aldrin, 81-0646
Carbaryl, 81-0646
2,4-D, 81-0403
DDT, 81-0646, 81-0660
Lindane, 81-0646
Malathion, 81-0646
Oxamyl, 81-0110
Parathion, 81-0646
Permethrin, 81-0108
Phosalone, 81-0122
Persistence
Asulam, 81-0422
Atrazine, 81-0443
Bromoxynil, 81-0422
Carbendazim, 81-0059
Carbofuran, 81-0429
Chlorfenvinphos, 81-0072
2,4-D, 81-0422
DDT, 81-0399, 81-0429, 81-0431
DDT derived compounds 81-0675
Dieldrin, 81-0399, 81-0431
Dinitramine, 81-0442
Dioxins, 81-0332
Disulfoton, 81-0380
Endosulfan, 81-0090, 81-0431
Ethoprop, 81-0380
Glyphosate, 81-0404
Heptachlor, 81-0399
Linuron, 81-0103
MCPA, 81-0422
Methyl parathion, 81-0429
Organic arsenicals, 81-0105
Organophosphates, 81-0431
Parathion, 81-0429

Residues/soil (cont'd)
Phorate, 81-0400
Phosalone, 81-0122
Picloram, 81-0402
Prometryne, 81-0103
Quintozene, 81-0059
Terbuphos, 81-0400
Sediment, 81-0361
Carbaryl, 81-0175
Chlordecone, 81-0439
Chlorfenvinphos, 81-0175
DDE, 81-0276
DDT, 81-0439
Dieldrin, 81-0439
Diflubenzuron, 81-0439
Heptachlor, 81-0439
Hexachlorobenzene, 81-0276
Organochlorines, 81-0411
Organomercury fungicides 81-0633
PCP, 81-0073
Polychlorinated biphenyls 81-0276, 81-0393, 81-0411
Propoxur, 81-0175
TDE, 81-0411
Soil types
Aldrin, 81-0080, 81-0646
Carbaryl, 81-0646
DDT, 81-0646
DDT derived compounds 81-0675
Dieldrin, 81-0080
Endrin, 81-0080
Lindane, 81-0646
Malathion, 81-0646
Paraoxon, 81-0097
Parathion, 81-0097, 81-0646
Phorate, 81-0400
Picloram, 81-0060
Terbuphos, 81-0400
Volatilization
Chlorpyrifos, 81-0064
DDT, 81-0064
Dioctyl phthalate, 81-0064
Hexachlorobenzene, 81-0064
Molinate, 81-0407
Paraoxon, 81-0097
Parathion, 81-0097
Polychlorinated biphenyls 81-0393

Residues/water
General, 81-0361
Organomercury fungicides 81-0633
Phosalone, 81-0122
Drinking water
Oxadiazon, 81-0437
Groundwater/rain
Alachlor, 81-0420
Atrazine, 81-0420
BHC isomers, 81-0679
Chlordane, 81-0679
DBCP, 81-0653
DDT, 81-0653, 81-0679
Dieldrin, 81-0679
Hexachlorobenzene, 81-0679
Organochlorines, 81-0420

Residues/water (cont'd)
Organochlorines, 81-0427
Polychlorinated biphenyls 81-0679
Silvex, 81-0420
Lakes/ponds, 81-0686
Oxadiazon, 81-0437
Polychlorinated biphenyls 81-0393
Oceans/seas
Aldrin, 81-0412
DDT, 81-0412
Dieldrin, 81-0412
Polychlorinated biphenyls 81-0412
Rivers/streams, 81-0686
BHC, 81-0374
Carbaryl, 81-0650
2,4-D, 81-0440, 81-0441
Dieldrin, 81-0436
Oxadiazon, 81-0437
Runoff/irrigation ditches, 81-0405
Glyphosate, 81-0404
Herbicides, 81-0074
IBP, 81-0654
Nitroanilines, 81-0074
Paraquat, 81-0074
Picloram, 81-0402
Sediment, 81-0686
Aldrin, 81-0412
Chlordecone, 81-0075
DDT, 81-0412
Dieldrin, 81-0412
IBP, 81-0654
Organochlorines, 81-0411
Polychlorinated biphenyls 81-0393, 81-0411, 81-0412
TDE, 81-0411

Respiration, cellular
see also Biochemical effects
Animals/experimental
Dichlorvos, 81-0509
Fenitrothion, 81-0512
In vitro
Carbaryl, 81-0471
Chlorfenvinphos, 81-0471
2,4-D, 81-0472
DDE, 81-0500
DDT, 81-0500
Paraquat, 81-0472
Plants
DDE, 81-0478
DDT, 81-0478

Respiratory system
see also Gills; Lung
General, 81-0008
Animals/experimental
BHC, 81-0203
Copper oxychloride, 81-0203
Copper sulfate, 81-0203
DDT, 81-0203
Endosulfan, 81-0203
MEMC, 81-0203
Mercuric chloride, 81-0203
PMA, 81-0203
Human, 81-0837

Reticuloendothelial system
Animals/experimental
Carbaryl, 81-0854
Chlorfenvinphos, 81-0174
Tributyltin, 81-0745

Reviews
General
Acenaphthene, 81-0810
Acrylonitrile, 81-0811
Aldrin, 81-0812
Arsenic, 81-0813
BHC, 81-0825
Chlordane, 81-0814
DDT, 81-0818
Dieldrin, 81-0812
DNOC, 81-0828
Endosulfan, 81-0821
Endrin, 81-0822
Fumigant insecticides, 81-0815 81-0819
Heptachlor, 81-0824
Methyl bromide, 81-0823
Naphthalene, 81-0827
Nematicides, 81-0820
Organochlorines, 81-0815
PCP, 81-0829
Substituted aromatic fungicides 81-0815
Substituted aromatic herbicides 81-0815, 81-0817
Thallium, 81-0832
Toxaphene, 81-0833
Analysis, 81-0597, 81-0898
Benomyl, 81-0894
Carbendazim, 81-0894
Chlordecone, 81-0898
Dioxins, 81-0328, 81-0346
Ethylene dichloride, 81-0638
Polychlorinated biphenyls 81-0898
Thiabendazole, 81-0894
Thiophanate-methyl, 81-0894
Epidemiology, prevention, and treatment, 81-0699, 81-0703 81-0704, 81-0705, 81-0707 81-0708, 81-0709, 81-0720
Aldrin, 81-0738
Dieldrin, 81-0738
Dioxins, 81-0722
Ethylene dichloride, 81-0638
2,4,5-T, 81-0722
Toxaphene, 81-0739
Monitoring and residues, 81-0375 81-0376, 81-0428
Dioxins, 81-0346
Ethylene dichloride, 81-0638
Toxicology and pharmacology 81-0699, 81-0749, 81-0758
Acephate, 81-0776
Aldrin, 81-0772, 81-0773, 81-0777 81-0781
Azinphosmethyl, 81-0774
Benomyl, 81-0778
BHC, 81-0777
BHC isomers, 81-0754
Bromacil, 81-0776
Cacodylic acid, 81-0776

Reviews (cont'd)
Captan, 81-0776, 81-0779
Carbamates, 81-0762, 81-0775
Carbaryl, 81-0781
Chloramben, 81-0779
Chlordane, 81-0772, 81-0777
Chlordecone, 81-0777
Chlordimeform, 81-0780
Chlorobenzilate, 81-0779
2,4-D, 81-0349
DBCP, 81-0777, 81-0779
DDT, 81-0772
Demeton, 81-0776
Di-allate, 81-0778
Dichlorvos, 81-0774
Dicofol, 81-0779
Dicrotophos, 81-0774
Dieldrin, 81-0772, 81-0777
Dimethoate, 81-0779
Dioxins, 81-0349, 81-0777
EPN, 81-0775
Ethylene dibromide, 81-0741 81-0779
Ethylene dichloride, 81-0638
Folpet, 81-0776
Fungicides, 81-0614
Heptachlor, 81-0772, 81-0773
Herbicides, 81-0772
Hexachlorobenzene, 81-0513 81-0741
Lindane, 81-0754, 81-0772 81-0773
Malathion, 81-0773, 81-0781
Maleic hydrazide, 81-0777 81-0778
Methoxychlor, 81-0773
Mevinphos, 81-0774
Mipafox, 81-0775
Mirex, 81-0772, 81-0777
Molinate, 81-0773
Monocrotophos, 81-0774, 81-0776
Monuron, 81-0778
Nitrofen, 81-0779
Organochlorines, 81-0773 81-0779, 81-0835
Organophosphates, 81-0762 81-0777, 81-0779
Parathion, 81-0773, 81-0775
Phenoxy acids, 81-0773
Propanil, 81-0780
Quintozene, 81-0779
Rotenone, 81-0778
Simazine, 81-0776
Strobane, 81-0777
Sulfallate, 81-0779
Synergists, 81-0772
2,4,5-T, 81-0349, 81-0773
Toxaphene, 81-0772
Triallate, 81-0778
Trichlorfon, 81-0775, 81-0776 81-0777
Trifluralin, 81-0779

Safety standards
General, 81-0322, 81-0627, 81-0701 81-0702, 81-0720
Aldrin, 81-0738
Carbamates, 81-0728

Safety standards (cont'd)
Dieldrin, 81-0738
Organophosphates, 81-0728
Acceptable daily intake, 81-0148
Pyrazophos, 81-0198
Reentry time, 81-0730, 81-0731
Insecticides, 81-0446
Organophosphates, 81-0446 81-0729
Permethrin, 81-0446
TLV/MAC, 81-0382
BHC, 81-0461
Dipyridylphosphate, 81-0698
Ethylene dibromide, 81-0453
MCPA, 81-0222
Metazine, 81-0135
Parathion, 81-0735
Polychlorinated biphenyls 81-0461
Propachlor, 81-0712
Tolerances, 81-0148
Toxicity rating class, 81-0726
Captan, 81-0451
Chlordecone, 81-0457
DBCP, 81-0457
Dioxacarb, 81-0785
Dioxins, 81-0457
Ethylene dibromide, 81-0457
Organophosphates, 81-0785
Propachlor, 81-0785
Thiram, 81-0785
Water standards
Azinphosmethyl, 81-0183
Benacil, 81-0516
Carbaryl, 81-0175
Chlorfenvinphos, 81-0175
Organochlorines, 81-0460
Organophosphates, 81-0460
Parathion, 81-0183, 81-0460
Propoxur, 81-0175
Toxaphene, 81-0739

Sensory system
see Eyes

Skin
see also Integument
Human
Dioxins, 81-0149, 81-0721
Etisazole, 81-0494
Fundazol, 81-0132, 81-0133
Organic arsenicals, 81-0149 81-0192
Propachlor, 81-0712
2,4,5-T, 81-0239, 81-0721
Thiram, 81-0132
Trichlorfon, 81-0132
Zozanex, 81-0132

Spectrometry
see also Analysis
Atomic absorption/emission, 81-0563
Daminozide, 81-0592
MSMA, 81-0592
Colorimetry
Chlortoluron, 81-0264
Daminozide, 81-0423
Dithianon, 81-0874
PCP, 81-0571

Spectrometry (cont'd)
TCA, 81-0267
Fluorometry
Benomyl, 81-0860
Carbamates, 81-0286
Diphacinone, 81-0860
Fungicides, 81-0859
Herbicides, 81-0859
Insecticides, 81-0859
Quinomethionate, 81-0860
Infrared
Thiofanox, 81-0867
Mass spectrometry, 81-0563, 81-0886
Auxins, 81-0578
Bromophos, 81-0297
Carbamate herbicides, 81-0897
Chlordane, 81-0580
DDT, 81-0580
DDT derived compounds 81-0574
Dioctyl phthalate, 81-0263
Dioxins, 81-0328, 81-0569 81-0602
Fenthion, 81-0297
Hexachlorobenzene, 81-0580
Methoxychlor, 81-0283
Methyl parathion, 81-0869
Mirex, 81-0561
Organochlorines, 81-0899
Organotin fungicides, 81-0870
Parathion, 81-0297
Polychlorinated biphenyls 81-0580
Substituted ureas, 81-0897
Tetradifon, 81-0869
Thiocarbamate herbicides 81-0897
NMR
Fenvalerate, 81-0806
Radiometry
DDT, 81-0270
UV
Alloxydim-dosium, 81-0891

Spinal cord
Animals/experimental
DFP, 81-0552
Paraoxon, 81-0552
In vitro
DFP, 81-0552
Paraoxon, 81-0552

Teratogenesis
see also Reproduction/growth
General, 81-0777
Kalixin, 81-0198
Pyrazophos, 81-0198
Animals/experimental
DDT, 81-0802
Diquat, 81-0482
Ethylene oxide, 81-0547
Paraquat, 81-0482
Phenoxy acids, 81-0199
Solvents, 81-0548
Human
2,4-D, 81-0462
Dioxins, 81-0452
Insecticides, 81-0462

Teratogenesis (cont'd)
2,4,5-T, 81-0452, 81-0462
Warfarin, 81-0766

Thermal decomposition
see Residue degradation

Thyroid
see also Endocrine system
Animals/experimental
Dichlorvos, 81-0541
Ferbam, 81-0242

Titration
see also Analysis
Fluometuron, 81-0900
Meturin, 81-0900

Toxicity/experimental organisms
General, 81-0003, 81-0006, 81-0603 81-0627
Carbaryl, 81-0556
Carbon tetrachloride, 81-0124
Chlordecone, 81-0124
Dioxins, 81-0124
Ethylene thiourea, 81-0761
Organochlorines, 81-0640
PCP, 81-0154
Phenoxy acids, 81-0241
Polychlorinated biphenyls 81-0124
Thiram, 81-0556
Toxaphene, 81-0154
Triallate, 81-0556
Zineb, 81-0556
Amphibians
DDT, 81-0188
Endrin, 81-0508
Toxaphene, 81-0508
Annelids
Aldicarb, 81-0763
Benomyl, 81-0763
Carbaryl, 81-0157
Chlordane, 81-0157
Chloridazon, 81-0763
2,4-D, 81-0157
DDT, 81-0157
Dimethoate, 81-0763
DNOC, 81-0763
Lindane, 81-0763
Malathion, 81-0157
Maneb, 81-0763
Methabenzthiazuron, 81-0763
Methiocarb, 81-0763
Methoxychlor, 81-0157
Nitrofen, 81-0763
Parathion, 81-0763
Simazine, 81-0763
Birds, 81-0168
DDT, 81-0802
Glyphosate, 81-0489
Paraoxon, 81-0808
Pirimiphos-methyloxon, 81-0808
Cat
Chlordimeform, 81-0759
DFP, 81-0532
Sodium fluoroacetate, 81-0841
Chicken
Cyanofenphos, 81-0798

Toxicity/experimental organisms (cont'd)
Cyanophos, 81-0468
EPN, 81-0468
Fenitrothion, 81-0468
Leptophos, 81-0468, 81-0483 81-0799
Methyl parathion, 81-0468
Tri-*o*-cresyl phosphate, 81-0842
Cow
Trichlorfon, 81-0554
Crustacea
Diflubenzuron, 81-0163
PCP, 81-0485
Dog
Chlordimeform, 81-0759
Etridiazol, 81-0840
Paraquat, 81-0233
Pronamide, 81-0197
Fish, 81-0160
BHC, 81-0203
Carbaryl, 81-0175, 81-0504
Chlordane, 81-0504
Chlorfenvinphos, 81-0175
Copper oxychloride, 81-0203 81-0555
Copper sulfate, 81-0203
2,4-D, 81-0162, 81-0534, 81-0848
DDT, 81-0203
Demeton-O-methyl, 81-0504
Endosulfan, 81-0203
Endothall, 81-0487
Fenitrothion, 81-0204, 81-0784
Herbicides, 81-0487
Hexachlorobenzene, 81-0184
Malathion, 81-0850
MEMC, 81-0203
Mercuric chloride, 81-0203
Organochlorines, 81-0555
Organophosphates, 81-0555
Permethrin, 81-0782
Picloram, 81-0534
PMA, 81-0203
Propoxur, 81-0175
2,4,5-T, 81-0848
Temephos, 81-0784
Tin trimethylchloride, 81-0167
Guinea pig
Organophosphates, 81-0786
Rotenone, 81-0214
In vitro
DDT, 81-0220
Methoxychlor, 81-0224
Organophosphates, 81-0786
PMA, 81-0173
Substituted ureas, 81-0231
Insects
2,4-D, 81-0848
Insecticides, 81-0352, 81-0501
Microbials, 81-0501
Organophosphates, 81-0352
2,4,5-T, 81-0848
Mammals
Chlorfenvinphos, 81-0072
Fungicides, 81-0304
Organomercury fungicides 81-0304

Toxicity/experimental organisms (cont'd)
Organotin fungicides, 81-0304
Paraoxon, 81-0808
Pirimiphos-methyloxon, 81-0808
Microorganisms, 81-0152
Barban, 81-0398
Carbaryl, 81-0175, 81-0498
Carbendazim, 81-0212
Chlorfenvinphos, 81-0175
4-Chloroaniline, 81-0398
Chlorpyrifos, 81-0498
DDT, 81-0243
Fungicides, 81-0229
Heavy metals, 81-0159
Malathion, 81-0498
Polychlorinated biphenyls 81-0243
Propoxur, 81-0175, 81-0498
Temephos, 81-0498
Molluscs
DDT, 81-0206
Heavy metals, 81-0161
Monkey
DDT, 81-0517
Dioxins, 81-0623, 81-0804
Mouse, 81-0246
Benacil, 81-0516
BHC, 81-0182
2,4-D, 81-0182
Dioxins, 81-0226, 81-0613
Dipyridylphosphate, 81-0698
Hexachlorobenzene, 81-0182 81-0226
Lindane, 81-0230
MCPA, 81-0182
Metazine, 81-0135
Methylmercuric chloride, 81-0244
Nitrofen, 81-0215
Pronamide, 81-0197
2,4,5-T, 81-0182
Zineb, 81-0230
Pheasant
Captan, 81-0787
Carbofuran, 81-0787
Chlorpyrifos, 81-0787
Diazinon, 81-0787
Plankton/algae
Azinphosmethyl, 81-0183
Parathion, 81-0183
PCP, 81-0154
Toxaphene, 81-0154
Plants
Carbaryl, 81-0175
Chlorfenvinphos, 81-0175
2,4-D, 81-0558
Nitrofen, 81-0558
Propoxur, 81-0175
Terbacil, 81-0558
Uracils, 81-0558
Polychaetes
3,4-Dichloroaniline, 81-0505
Dieldrin, 81-0505
PCP, 81-0505
Quail
Methyl parathion, 81-0486
Rabbit
Toxicity/experimental organisms (cont'd)
Azinphosmethyl, 81-0774
Butachlor, 81-0800
Chlordimeform, 81-0759, 81-0800
Chlorobenzilate, 81-0800
CNP, 81-0800
Deet, 81-0844
Dichlorvos, 81-0774
Dicrotophos, 81-0774
Dipyridylphosphate, 81-0698
Disulfoton, 81-0800
Etridiazol, 81-0840
Fenitrothion, 81-0800
Methomyl, 81-0800
Mevinphos, 81-0774
Monocrotophos, 81-0774
MTMC, 81-0800
Organophosphates, 81-0786
Thiophanate-methyl, 81-0800
Zineb, 81-0800
Rat
Aldrin, 81-0186
Amitrole, 81-0249
Anilate, 81-0194
Benacil, 81-0516
BHC, 81-0182
Bioresmethrin, 81-0537
Cadmium chloride, 81-0254
Carbaryl, 81-0176
Chlorbromuron, 81-0194
Chlordimeform, 81-0150, 81-0759
Chlorfenvinphos, 81-0171 81-0174
Chlorthiamid, 81-0245
Cismethrin, 81-0537
2,4-D, 81-0182
DBCP, 81-0839
DDT, 81-0220, 81-0221
Dieldrin, 81-0186
Dioxacarb, 81-0785
Dioxins, 81-0623
Dipyridylphosphate, 81-0698
Disulfiram, 81-0249
Enzyme activity, 81-0249
Etridiazol, 81-0840
Fenitrothion, 81-0250
Fenvalerate, 81-0806
Ferbam, 81-0242
Hexachlorobenzene, 81-0182 81-0239, 81-0254
Insecticides, 81-0352
Lindane, 81-0180, 81-0230
Malathion, 81-0247
MCPA, 81-0182, 81-0222
Mercuric chloride, 81-0254
Metazine, 81-0135
Methoxychlor, 81-0224
Methyl bromide, 81-0838
Mirex, 81-0216
Organophosphates, 81-0352 81-0785, 81-0786
PCP, 81-0847
Phosphamidon, 81-0177, 81-0178
PMA, 81-0173, 81-0240
Pronamide, 81-0197
Propachlor, 81-0785
Toxicity/experimental organisms (cont'd)
Pyrazophos, 81-0194
Pyriminil, 81-0497
Quintozene, 81-0254
2,4,5-T, 81-0180, 81-0182
Thiofanox, 81-0211
Thiram, 81-0785
Zinc phosphide, 81-0518
Zineb, 81-0230

Toxicity/humans
General, 81-0126, 81-0702
Azinphosmethyl, 81-0706
BHC, 81-0182
Carbamates, 81-0228, 81-0865
Chlordimeform, 81-0780
Chlorpyrifos, 81-0691
2,4-D, 81-0182
DDT, 81-0196
Dicrotophos, 81-0691
Dioxins, 81-0623, 81-0695
Diquat, 81-0228
Hexachlorobenzene, 81-0182
Leptophos, 81-0706
Malathion, 81-0691
MCPA, 81-0182
Methamidophos, 81-0706
Methomyl, 81-0706
Organic arsenicals, 81-0202
Organochlorines, 81-0865
Organophosphates, 81-0228 81-0696, 81-0865
Paraquat, 81-0146, 81-0228 81-0793
Parathion, 81-0228, 81-0691
Propanil, 81-0780
2,4,5-T, 81-0182, 81-0695
Thallium, 81-0185, 81-0196
Thallium sulfate, 81-0185
Accidental
Aldicarb, 81-0140
Bifenox, 81-0736
BPMC, 81-0796
Camphor, 81-0201
Dioxins, 81-0721
Edifenphos, 81-0796
Ethoprop, 81-0736
Fenthion, 81-0796
Insecticides, 81-0463
Lindane, 81-0464
Merphos, 81-0736
Mevinphos, 81-0803
Organophosphates, 81-0303
Paraquat, 81-0795, 81-0797
Parathion, 81-0228
2,4,5-T, 81-0721
Intentional
Lead arsenate, 81-0791
Paraquat, 81-0038, 81-0794
Rodenticides, 81-0491
Sodium fluoride, 81-0491
Occupational, 81-0145, 81-0631 81-0634, 81-0688, 81-0710 81-0727, 81-0836
Carbamates, 81-0683, 81-0728
Chlordecone, 81-0339
DBCP, 81-0141

Toxicity/humans (cont'd)
DEF, 81-0397
Dioxins, 81-0049, 81-0149
Edifenphos, 81-0666
Ethylene oxide, 81-0131
Fenitrothion, 81-0728
Fenthion, 81-0666
Fundazol, 81-0132, 81-0133
Herbicides, 81-0450
Organic arsenicals, 81-0149
81-0192, 81-0202
Organochlorines, 81-0147
81-0851
Organophosphates, 81-0134
81-0683, 81-0728, 81-0851
PCP, 81-0693
Phenoxy acids, 81-0450
Propachlor, 81-0712
Thiram, 81-0132
Trichlorfon, 81-0132
Zoxanex, 81-0132

Toxicity/non-target organisms
see also Phytotoxicity
General, 81-0003, 81-0005, 81-0690
Azinphosmethyl, 81-0706
Carbon tetrachloride, 81-0124
Chlordecone, 81-0124
Dioxins, 81-0124
Leptophos, 81-0706
Methamidophos, 81-0706
Methomyl, 81-0706
Organochlorines, 81-0543
Polychlorinated biphenyls
81-0124
Birds
DDE, 81-0528
DDT, 81-0399
Dieldrin, 81-0399
Heptachlor, 81-0399
Polychlorinated biphenyls
81-0528
Crustacea, 81-0690
Eggs
DDE, 81-0528
Polychlorinated biphenyls
81-0528
Insects, 81-0663
Bacillus thuringiensis, 81-0227
Sulfur dioxide, 81-0238
Microorganisms
BHC, 81-0662
Carbendazim, 81-0082
Chlorpropham, 81-0648
Chlortoluron, 81-0648
Copper sulfate, 81-0438
1,3-D, 81-0655
Isoproturon, 81-0648
Organophosphates, 81-0652
Phytotoxicity, 81-0655
Plankton/algae, 81-0663
Plants, 81-0690
Fenitrothion, 81-0020

Translocation
see also Absorption
Aquatics
MSMA, 81-0119
Crops
Buthidazole, 81-0088
Diclofop-methyl, 81-0034
Fenapanil, 81-0025
Fenarimol, 81-0025
Glyphosate, 81-0016
Herbicides, 81-0353
Permethrin, 81-0108
Prometryne, 81-0089
Quintozene, 81-0085
Thiazoles, 81-0365
Triadimefon, 81-0056
Trees/shrubs
Daminozide, 81-0112
Maleic hydrazide, 81-0112

Treatment of poisoning
General
Carbamates, 81-0458
Organophosphates, 81-0458
Diagnosis
Insecticides, 81-0463

Ultrastructure/morphology
see also Cytological effects
Animals/experimental
Phosphamidon, 81-0477

Upper respiratory tract
see Respiratory system

Vitamins/coenzymes
see also Biochemical effects
In vitro
DDT, 81-0469

Subject Index: Compounds

Acenaphthene
see also Fumigant insecticides
Reviews
General, 81-0810

Acephate
see also Organophosphates
Carcinogenesis
General, 81-0776
Enzyme activity
Esterases, 81-0217
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0217
Mutagenesis
General, 81-0776
Residue removal
Plants, 81-0681
Residues/plants
Crops, 81-0681
Reviews
Toxicology and pharmacology 81-0776

Acetaldehyde
see also Fumigant insecticides
Phytotoxicity
Crops, 81-0617

Acrylonitrile
see also Fumigant insecticides
Reviews
General, 81-0811

Afugan
see Pyrazophos

Aktinit PK
see Atrazine

Alachlor
see also Substituted amines
Amino acids/peptides/proteins
In vitro, 81-0033
Biotransformation
Plants, 81-0656
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0021
Formulation, 81-0364
Interactions, 81-0367
Phytotoxicity
Crops, 81-0021, 81-0367, 81-0656
Residue degradation
Soil, 81-0656
Residues/food and feed
Vegetables, 81-0656
Residues/plants
Crops, 81-0364
Residues/soil
Adsorption, 81-0656
Residues/water
Groundwater/rain, 81-0420

Aldicarb
see also Carbamates
Absorption
Annelids, 81-0236
Models
Computer, 81-0111
Residue degradation
Soil, 81-0109, 81-0111
Residues/food and feed
Vegetables, 81-0140, 81-0672 81-0676
Residues/plants
Crops, 81-0672
Residues/soil
Movement, 81-0111
Toxicity/experimental organisms
Annelids, 81-0763
Toxicity/humans
Accidental, 81-0140

Aldrin
see also Organochlorines
Absorption
Annelids, 81-0236
Analysis
Sample preparation, 81-0872
Biotransformation
General, 81-0773
In vitro, 81-0764
Microorganisms, 81-0678
Carcinogenesis
General, 81-0777
Animals/experimental, 81-0186
Cartilage
Animals/experimental, 81-0153
Chromatography
Gas-liquid, 81-0570, 81-0872 81-0877
Distribution/storage
General, 81-0773
Mouse, 81-0153
Enzyme activity
Cholinesterase, 81-0781
Mixed function oxidases, 81-0764 81-0772
Experimental design
Analysis, 81-0877
Laws and regulations
USA-NIOSH, 81-0738
Liver
Animals/experimental, 81-0186
Residue degradation
Soil, 81-0080, 81-0678
Water, 81-0678
Residues/food and feed
Vegetables, 81-0078, 81-0079
Residues/non-target organisms
Crustacea, 81-0412
Molluscs, 81-0412
Residues/plants
Tobacco, 81-0381
Residues/soil
Adsorption, 81-0646
Movement, 81-0646
Soil types, 81-0080, 81-0646
Residues/water
Oceans/seas, 81-0412
Sediment, 81-0412
Reviews
General, 81-0812
Epidemiology, prevention, and treatment, 81-0738
Toxicology and pharmacology 81-0772, 81-0773, 81-0777 81-0781
Safety standards
General, 81-0738
Toxicity/experimental organisms
Rat, 81-0186

Aliphatic and alicyclic nitrogen compounds
see Dodine; DPX-3217; Fenarimol; Fungicides; Metalaxyl; Oxyquinoline sulfate

Aliphatic and arylaliphatic acids
see Daminozide; Ethephon; Ethoprop; Herbicides; Merphos; TCA; TCPE

Alloxydim-sodium
see Substituted aromatic herbicides
Analysis
Sample preparation, 81-0891
Chromatography
Gas-liquid, 81-0891
HPL, 81-0891
Spectrometry
UV, 81-0891

Amiben
see Chloramben

Aminocarb
see also Carbamates
Analysis
Sample preparation, 81-0882
Chromatography
Gas-liquid, 81-0879, 81-0882

Amitrole
see also Nitrogen heterocyclic herbicides
Carcinogenesis
Animals/experimental, 81-0544
Chromatography
HPL, 81-0883
Enzyme activity
General, 81-0249
Factors influencing metabolism/toxicity
General, 81-0544
Interactions, 81-0252, 81-0515
Kidney
Animals/experimental, 81-0515
Liver
Animals/experimental, 81-0249 81-0515
In vitro, 81-0252

Amitrole (cont'd)
Lung
Animals/experimental, 81-0515
Porphyrins/pigments
In vitro, 81-0252
Toxicity/experimental organisms
Rat, 81-0249

Anilate
see also Substituted aromatic fungicides
Heart
Animals/experimental, 81-0194
Toxicity/experimental organisms
Rat, 81-0194

Anilazine
Chromatography
Gas-liquid, 81-0584

ANTU
see also Rodenticides
Biotransformation
Rat, 81-0187
Lung
Animals/experimental, 81-0187

Arsenic
Reviews
General, 81-0813

Asulam
see also Carbamate herbicides
Analysis
Sample preparation, 81-0272
Chromatography
Liquid, 81-0272
Factors influencing metabolism/toxicity
Geographic location, 81-0053
Phytotoxicity
Crops, 81-0053
Residues/soil
General, 81-0120
Persistence, 81-0422

Atrazine
see also Triazine herbicides
Absorption
Fish, 81-0557
Molluscs, 81-0557
Amino acids/peptides/proteins
In vitro, 81-0033
Plants, 81-0301
Biotransformation
Microorganisms, 81-0371, 81-0644
Chromatography
Gas-liquid, 81-0591, 81-0875
HPL, 81-0591
Chromosomes/genes
Human, 81-0711
In vitro, 81-0749
Distribution/storage
Fish, 81-0557
Molluscs, 81-0557
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0301
Geographic location, 81-0053
Gills

Atrazine (cont'd)
Animals/experimental, 81-0557
Metabolism
In vitro, 81-0207
Mutagenesis
In vitro, 81-0749
Phytotoxicity
Crops, 81-0053, 81-0301
Prevention
Decontamination, 81-0737
Protective practices, 81-0711
Residue degradation
Soil, 81-0371, 81-0644, 81-0660
Residue dynamics, 81-0673
Residue removal
Water, 81-0737
Residues/air
Industrial, 81-0711
Residues/soil
Persistence, 81-0443
Residues/water
Groundwater/rain, 81-0420

Auxins
Chromatography
Gas-liquid, 81-0578
Spectrometry
Mass spectrometry, 81-0578

Azinphosmethyl
see also Organophosphates
Enzyme activity
Cholinesterase, 81-0774
Morbidity and mortality statistics
Egypt, 81-0706
Residues/food and feed
Fruits, 81-0414
Reviews
Toxicology and pharmacology 81-0774
Safety standards
Water standards, 81-0183
Toxicity/experimental organisms
Plankton/algae, 81-0183
Rabbit, 81-0774
Toxicity/humans
General, 81-0706
Toxicity/non-target organisms
General, 81-0706

Azodrin
see Monocrotophos

Bacillus sphaericus
see also Microbials
Alternative controls, 81-0040

Bacillus thuringiensis
see also Microbials
Alternative controls, 81-0029 81-0312, 81-0357, 81-0615
Analysis
Sample preparation, 81-0890
Chromatography
Electrophoresis, 81-0565
Factors influencing metabolism/toxicity
Age, 81-0029
Immunoassay, 81-0565
Toxicity/non-target organisms

***Bacillus thuringiensis* (cont'd)**
Insects, 81-0227

Barban
see also Substituted amines
Residue degradation
Soil, 81-0398
Toxicity/experimental organisms
Microorganisms, 81-0398

Bavistin
see Carbendazim

Benacil
Enzyme activity
General, 81-0516
Safety standards
Water standards, 81-0516
Toxicity/experimental organisms
Mouse, 81-0516
Rat, 81-0516

Benazolin
see also Thiocarbamate herbicides
Enzyme activity
General, 81-0046
Metabolism
In vitro, 81-0046

Benlate
see Benomyl

Benomyl
see also Benzimidazoles
Chromatography
HPL, 81-0582
Thin-layer, 81-0581, 81-0860
Chromosomes/genes
Animals/experimental, 81-0251
In vitro, 81-0251
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0037 81-0193
Interactions, 81-0484
Mutagenesis
General, 81-0778
Animals/experimental, 81-0251
In vitro, 81-0251
Residue dynamics, 81-0115
Residues/food and feed
Fruits, 81-0414
Vegetables, 81-0115
Reviews
Analysis, 81-0894
Toxicology and pharmacology 81-0778
Spectrometry
Fluorometry, 81-0860
Toxicity/experimental organisms
Annelids, 81-0763

Benzimidazoles
see Benomyl; Carbendazim; Fungicides; Thiabendazole

Benzoximate
see also Insecticides
Analysis
Sample preparation, 81-0893
Chromatography

Benzoximate (cont'd)
HPL, 81-0893
Thin-layer, 81-0893

BHC
see also Organochlorines
Carcinogenesis
General, 81-0777
Distribution/storage
Rat, 81-0205
Enzyme activity
General, 81-0205, 81-0628
Growth
Animals/experimental, 81-0205
Liver
Animals/experimental, 81-0205
Morbidity and mortality statistics
Germany (DDR), 81-0719
USSR, 81-0136
Nervous system
Animals/experimental, 81-0203 81-0213
Prevention
Disposal, 81-0461
Reproduction/growth
Animals/experimental, 81-0203
Residues/food and feed
Total diet, 81-0665
Meat, 81-0374
Residues/humans
Adipose, 81-0378
Blood, 81-0669
Residues/non-target organisms
Cow, 81-0409
Residues/plants
Herbs, medicinals/condiments 81-0057, 81-0058
Tobacco, 81-0381
Residues/soil
General, 81-0662
Residues/water
Rivers/streams, 81-0374
Respiratory system
Animals/experimental, 81-0203
Reviews
General, 81-0825
Toxicology and pharmacology 81-0777
Safety standards
TLV/MAC, 81-0461
Toxicity/experimental organisms
Fish, 81-0203
Mouse, 81-0182
Rat, 81-0182
Toxicity/humans
General, 81-0182
Toxicity/non-target organisms
Microorganisms, 81-0662

γ-BHC
see Lindane

BHC isomers
see also Organochlorines
Chromatography
Gas-liquid, 81-0596
HPL, 81-0861
Thin-layer, 81-0861
Environmental pollution, 81-0679

BHC isomers (cont'd)
Enzyme activity
General, 81-0232
Cholinesterase, 81-0232
Experimental design
Analysis, 81-0861
Metabolism
In vitro, 81-0232
Insects, 81-0754
Mammals, 81-0754
Residues/air
Rural, 81-0679
Residues/water
Groundwater/rain, 81-0679
Reviews
Toxicology and pharmacology 81-0754

Bidrin
see Dicrotophos

Bifenox
see also Phenoxy acids
Morbidity and mortality statistics
USA-Tennessee, 81-0736
Prevention
Protective equipment, 81-0736
Toxicity/humans
Accidental, 81-0736

Bioresmethrin
Lung
Animals/experimental, 81-0537
Toxicity/experimental organisms
Rat, 81-0537

Bipyridyliums
see Diquat; Herbicides; Paraquat

Botanicals
see Insecticides; Nicotine; Rotenone

BPMC
see also Carbamates
Biochemical effects
Human, 81-0796
Nervous system
Human, 81-0796
Toxicity/humans
Accidental, 81-0796

Bromacil
see also Uracils
Carcinogenesis
General, 81-0776
Enzyme activity
General, 81-0046
Metabolism
In vitro, 81-0046
Mutagenesis
General, 81-0776
Reviews
Toxicology and pharmacology 81-0776

Bromophos
see also Organophosphates
Chromatography
Gas-liquid, 81-0297
Spectrometry
Mass spectrometry, 81-0297

Bromophos-ethyl
see also Organophosphates
Chromatography
HPL, 81-0861
Thin-layer, 81-0861
Experimental design
Analysis, 81-0861

Bromoxynil
see also Substituted nitriles
Analysis
Sample preparation, 81-0271
Chromatography
Gas-liquid, 81-0271, 81-0422
Residues/food and feed
Animal feed, 81-0271
Cereals, 81-0271
Residues/soil
Persistence, 81-0422

Butachlor
see also Substituted amines
Blood cells
Animals/experimental, 81-0800
Toxicity/experimental organisms
Rabbit, 81-0800

Buthidazole
see also Nitrogen heterocyclic herbicides
Amino acids/peptides/proteins
In vitro, 81-0033
Factors influencing metabolism/toxicity
Geographic location, 81-0053
Metabolism
Plankton/algae, 81-0088
Phytotoxicity
Crops, 81-0053
Translocation
Crops, 81-0088

Butylate
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0326
Phytotoxicity
Crops, 81-0326

Buvinol
see Atrazine; TCPE

Cacodylic acid
see also Organic arsenicals
Carcinogenesis
General, 81-0776
Mutagenesis
General, 81-0776
Reviews
Toxicology and pharmacology 81-0776

Cadmium
Factors influencing metabolism/toxicity
Interactions, 81-0783

Cadmium chloride
see also Inorganic fungicides
Factors influencing metabolism/toxicity

Cadmium chloride (cont'd)
Interactions, 81-0254
Toxicity/experimental organisms
Rat, 81-0254

Camphor
see also Fumigant insecticides
Toxicity/humans
Accidental, 81-0201

Captafol
see also Dicarboximides
Absorption
Annelids, 81-0236

Captan
see also Dicarboximides
Absorption
Annelids, 81-0236
Behavior
Animals/experimental, 81-0787
Carcinogenesis
General, 81-0776
Animals/experimental, 81-0451 81-0779
Chromatography
HPL, 81-0579
Factors influencing metabolism/ toxicity
General, 81-0787
Interactions, 81-0484
Mutagenesis
General, 81-0776
Animals/experimental, 81-0451
Residues/plants
Crops, 81-0114, 81-0444
Reviews
Toxicology and pharmacology 81-0776, 81-0779
Safety standards
Toxicity rating class, 81-0451
Toxicity/experimental organisms
Pheasant, 81-0787

Carbamate herbicides
see also Asulam; Chlorpropham; Herbicides
Carcinogenesis
Animals/experimental, 81-0199
Chromatography
HPL, 81-0897
Liquid, 81-0258
Models
Mathematical, 81-0069
Residue degradation
Soil, 81-0388
Water, 81-0388
Residue dynamics, 81-0069
Residues/food and feed
Total diet, 81-0100
Spectrometry
Mass spectrometry, 81-0897

Carbamates
see also Aldicarb; Aminocarb; BPMC; Carbaryl; Carbofuran; Dioxacarb; FMC-31768; FMC-35001; Insecticides; Methiocarb Methomyl; MTMC; Oxamyl; Pirimicarb; Propoxur; Thi-

Carbamates (cont'd)
ofanox
Absorption
Fish, 81-0801
Insects, 81-0801
Molluscs, 81-0801
Analysis
Sample preparation, 81-0286 81-0864
Carcinogenesis
General, 81-0740
Animals/experimental, 81-0199
Chromatography
HPL, 81-0286
Liquid, 81-0258
Thin-layer, 81-0865
Distribution/storage
Human, 81-0865
Enzyme activity
Cholinesterase, 81-0458, 81-0683 81-0728
Enzyme assay
Cholinesterase, 81-0856, 81-0887
Experimental design
Analysis, 81-0685, 81-0864
Monitoring and residues, 81-0643 81-0728
Factors influencing metabolism/ toxicity
Adaptation/resistance, 81-0488 81-0843
Hormones
General, 81-0740
Metabolism
General, 81-0740
Models
Mathematical, 81-0069
Monitoring devices/programs 81-0887
Air, 81-0685
Morbidity and mortality statistics
Hungary, 81-0710
World Health Organization 81-0728
Nervous system
Human, 81-0228
Polyneuritis
Animals/experimental, 81-0775
Human, 81-0775
Residue degradation
General, 81-0887
Soil, 81-0388
Water, 81-0388
Residue dynamics, 81-0069
Residues/food and feed
Total diet, 81-0100
Residues/humans
General, 81-0683
Reviews
Toxicology and pharmacology 81-0762, 81-0775
Safety standards
General, 81-0728
Spectrometry
Fluorometry, 81-0286
Toxicity/humans
General, 81-0228, 81-0865

Carbamates (cont'd)
Occupational, 81-0683, 81-0728
Treatment of poisoning
General, 81-0458

Carbaryl
see also Carbamates
Absorption
Annelids, 81-0236
Bioassay, 81-0157
Blood cells
Animals/experimental, 81-0176
Chromatography
Gas-liquid, 81-0879
Distribution/storage
General, 81-0659
Enzyme activity
General, 81-0232
Cholinesterase, 81-0232, 81-0781
Esterases, 81-0232
Excretion
Human, 81-0659
Factors influencing metabolism/ toxicity
Biological magnification, 81-0175
Disease state, 81-0026
Formulation, 81-0026
Interactions, 81-0026
Growth
Animals/experimental, 81-0498
Lipids/steroids/sterols
In vitro, 81-0232
Metabolism
In vitro, 81-0232
Mitochondria
In vitro, 81-0471
Monitoring devices/programs
General, 81-0659
Water, 81-0684
Phytotoxicity, 81-0175
Residue degradation
Water, 81-0175, 81-0650
Residue removal
Food and feed, 81-0104, 81-0671
Residues/non-target organisms
Fish, 81-0175
Molluscs, 81-0175
Plankton/algae, 81-0175
Residues/soil
Adsorption, 81-0646
Movement, 81-0646
Sediment, 81-0175
Soil types, 81-0646
Residues/water
Rivers/streams, 81-0650
Respiration, cellular
In vitro, 81-0471
Reticuloendothelial system
Animals/experimental, 81-0854
Reviews
Toxicology and pharmacology 81-0781
Safety standards
Water standards, 81-0175
Toxicity/experimental organisms
General, 81-0556
Annelids, 81-0157
Fish, 81-0175, 81-0504

Carbaryl (cont'd)
Microorganisms, 81-0175, 81-0498
Plants, 81-0175
Rat, 81-0176

Carbendazim
see also Benzimidazoles
Absorption
Annelids, 81-0236
Chromatography
HPL, 81-0573, 81-0582
Thin-layer, 81-0581
Chromosomes/genes
Microorganisms, 81-0788
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0193 81-0788
Microtubules
Microorganisms, 81-0212, 81-0767
Mitosis/meiosis
Microorganisms, 81-0767
Phytotoxicity
Crops, 81-0082
Residues/plants
Herbs, medicinals/condiments 81-0059
Trees/shrubs, 81-0421
Residues/soil
Adsorption, 81-0059
Persistence, 81-0059
Reviews
Analysis, 81-0894
Toxicity/experimental organisms
Microorganisms, 81-0212
Toxicity/non-target organisms
Microorganisms, 81-0082

Carbofuran
see also Carbamates
Absorption
Annelids, 81-0235
Behavior
Animals/experimental, 81-0787
Biotransformation
Fish, 81-0753
In vitro, 81-0753
Chromatography
Gas-liquid, 81-0879
Excretion
Annelids, 81-0235
Experimental design
Analysis, 81-0862
Factors influencing metabolism/toxicity
General, 81-0787
Microsomes
In vitro, 81-0753
Monitoring devices/programs
Water, 81-0684
Residue degradation
Soil, 81-0093, 81-0094
Residues/air
Agricultural, 81-0862
Residues/plants
Crops, 81-0429
Residues/soil
Persistence, 81-0429

Carbofuran (cont'd)
Toxicity/experimental organisms
Pheasant, 81-0787

Carbon tetrachloride
Distribution/storage
Rat, 81-0503
Environmental pollution, 81-0124
Enzyme activity
General, 81-0179
Experimental design
Epidemiology, prevention, and treatment, 81-0124
Toxicology and pharmacology 81-0124
Factors influencing metabolism/toxicity
Interactions, 81-0503
Liver
General, 81-0179
Animals/experimental, 81-0502 81-0503
Nucleic acids
Animals/experimental, 81-0502
Plasma/serum
General, 81-0179
Residues/air
Industrial, 81-0688
Toxicity/experimental organisms
General, 81-0124
Toxicity/non-target organisms
General, 81-0124

Carbophos
see Malathion

Carboxin
see also Oxathiines
Biotransformation
Microorganisms, 81-0408
Cytological effects
Plants, 81-0189, 81-0190
Mitosis/meiosis
Plants, 81-0189, 81-0190
Phytotoxicity, 81-0189, 81-0190
Residue degradation
In vitro, 81-0389, 81-0408

Cartap
Residues/food and feed
Vegetables, 81-0071

Cartex
see Propachlor

Ceresan
see PMA

Chloramben
see also Substituted aromatic herbicides
Carcinogenesis
Animals/experimental, 81-0779
Chromatography
Gas-liquid, 81-0876
Thin-layer, 81-0876
Experimental design
Monitoring and residues, 81-0876
Reviews
Toxicology and pharmacology 81-0779

Chlorbromuron
see also Substituted ureas
Heart
Animals/experimental, 81-0194
Toxicity/experimental organisms
Rat, 81-0194

Chlordane
see also Organochlorines
Bioassay, 81-0157
Carcinogenesis
General, 81-0777
Human, 81-0147
Chromatography
Gas-liquid, 81-0570, 81-0580
Environmental pollution, 81-0679
Enzyme activity
Mixed function oxidases, 81-0772
Monitoring devices/programs
Ecosystems, 81-0070
Residues/air
Rural, 81-0679
Residues/humans
Milk, 81-0386
Residues/water
Groundwater/rain, 81-0679
Reviews
General, 81-0814
Toxicology and pharmacology 81-0772, 81-0777
Spectrometry
Mass spectrometry, 81-0580
Toxicity/experimental organisms
Annelids, 81-0157
Fish, 81-0504

Chlordecone
see also Organochlorines
Analysis
Sample preparation, 81-0864
Biogenic amines
Animals/experimental, 81-0530
In vitro, 81-0530
Carcinogenesis
General, 81-0457, 81-0777
Distribution/storage
General, 81-0659
In vitro, 81-0771
Rat, 81-0503, 81-0771
Environmental pollution, 81-0124
Enzyme activity
ATPase, 81-0530
Excretion
Human, 81-0659
Experimental design
Analysis, 81-0864, 81-0898
Epidemiology, prevention, and treatment, 81-0124
Toxicology and pharmacology 81-0124
Factors influencing metabolism/toxicity
Interactions, 81-0503
Glands
Animals/experimental, 81-0771
In vitro, 81-0771
Laws and regulations
USA, 81-0130

Chlordecone (cont'd)
Liver
Animals/experimental, 81-0503
Models
Mathematical, 81-0075
Monitoring devices/programs
General, 81-0659
Ecosystems, 81-0070
Nervous system
Human, 81-0123
Prevention
Disposal, 81-0137
Residues/non-target organisms
Mouse, 81-0394
Residues/soil
Adsorption, 81-0075, 81-0439
Sediment, 81-0439
Residues/water
Sediment, 81-0075
Reviews
Analysis, 81-0898
Toxicology and pharmacology 81-0777
Safety standards
Toxicity rating class, 81-0457
Toxicity/experimental organisms
General, 81-0124
Toxicity/humans
Occupational, 81-0339
Toxicity/non-target organisms
General, 81-0124

Chlordimeform
see also Insecticides
Blood cells
Animals/experimental, 81-0800
Body fluids
Animals/experimental, 81-0150
Cardiovascular system
Animals/experimental, 81-0759
Enzyme activity
General, 81-0499
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0499
Interactions, 81-0499
Nervous system
Animals/experimental, 81-0759
Reviews
Toxicology and pharmacology 81-0780
Toxicity/experimental organisms
Cat, 81-0759
Dog, 81-0759
Rabbit, 81-0759, 81-0800
Rat, 81-0150, 81-0759
Toxicity/humans
General, 81-0780

Chlorfenvinphos
see also Organophosphates
Absorption
Annelids, 81-0236
Alimentary tract
Animals/experimental, 81-0474
Amino acids/peptides/proteins
Animals/experimental, 81-0473
In vitro, 81-0476

Chlorfenvinphos (cont'd)
Blood cells
Animals/experimental, 81-0473
In vitro, 81-0476
Enzyme activity
Cholinesterase, 81-0174, 81-0474
Excretory system
Animals/experimental, 81-0171
Factors influencing metabolism/toxicity
Biological magnification, 81-0175
Interactions, 81-0474
Hemoglobin/hematocrit
Animals/experimental, 81-0174
Mitochondria
In vitro, 81-0471
Muscle, smooth
Animals/experimental, 81-0474
Phytotoxicity, 81-0175
Residue degradation
Water, 81-0175
Residue removal
Food and feed, 81-0072
Residues/food and feed
General, 81-0072
Dairy products, 81-0072
Residues/non-target organisms
Fish, 81-0175
Molluscs, 81-0175
Plankton/algae, 81-0175
Residues/soil
Persistence, 81-0072
Sediment, 81-0175
Respiration, cellular
In vitro, 81-0471
Reticuloendothelial system
Animals/experimental, 81-0174
Safety standards
Water standards, 81-0175
Toxicity/experimental organisms
Fish, 81-0175
Mammals, 81-0072
Microorganisms, 81-0175
Plants, 81-0175
Rat, 81-0171, 81-0174

Chlorflurecol
Phytotoxicity
Crops, 81-0050

Chlorflurenol
see Chlorflurecol

Chloridazon
see also Nitrogen heterocyclic herbicides
Enzyme activity
General, 81-0200
Metabolism
Microorganisms, 81-0200
Toxicity/experimental organisms
Annelids, 81-0763

Chlormequat chloride
see also Substituted amines
Amino acids/peptides/proteins
Plants, 81-0642
Carbohydrates
Plants, 81-0641

Chlormequat chloride (cont'd)
Carcinogenesis
Animals/experimental, 81-0849
Chromatography
Thin-layer, 81-0577
Metabolism
Plants, 81-0641, 81-0642
Phytotoxicity
Crops, 81-0641, 81-0642

3-Chloro-*p*-toluidine
see Carbamates

4-Chloroaniline
Chromatography
Thin-layer, 81-0589
Residue degradation
Soil, 81-0398
Residues/soil
Adsorption, 81-0392
Toxicity/experimental organisms
Microorganisms, 81-0398

Chlorobenzilate
see also Organochlorines
Blood cells
Animals/experimental, 81-0800
Carcinogenesis
Animals/experimental, 81-0779
Reviews
Toxicology and pharmacology 81-0779
Toxicity/experimental organisms
Rabbit, 81-0800

Chlorophen
see PCP

Chloropicrin
see also Fumigant insecticides
Phytotoxicity
Crops, 81-0655
Residues/soil
General, 81-0655

Chlorothalonil
see also Substituted aromatic fungicides
Residue dynamics, 81-0115
Residues/food and feed
Vegetables, 81-0115
Residues/plants
Crops, 81-0444

Chlorpropham
see also Carbamate herbicides
Absorption
Human, 81-0733
Enzyme activity
General, 81-0046, 81-0048
Metabolism
In vitro, 81-0046
Prevention
Protective equipment, 81-0733
Residue degradation
Soil, 81-0648
Toxicity/non-target organisms
Microorganisms, 81-0648

Chlorpyrifos
see also Organophosphates
Absorption
Fish, 81-0064
Human, 81-0733
Behavior
Animals/experimental, 81-0787
Chromatography
Gas-liquid, 81-0595
Factors influencing metabolism/toxicity
General, 81-0787
Growth
Animals/experimental, 81-0498
Models
Environmental, 81-0064
Mathematical, 81-0410
Prevention
Protective equipment, 81-0733
Residue degradation
Water, 81-0410
Residues/humans
Blood, 81-0691
Organs, 81-0691
Urine, 81-0691
Residues/soil
Volatilization, 81-0064
Toxicity/experimental organisms
Microorganisms, 81-0498
Pheasant, 81-0787
Toxicity/humans
General, 81-0691

Chlorthiamid
see also Substituted amines
Liver
Animals/experimental, 81-0245
Toxicity/experimental organisms
Rat, 81-0245

Chlortoluron
see also Substituted ureas
Phytotoxicity, 81-0198
Residue degradation
Soil, 81-0648
Spectrometry
Colorimetry, 81-0264
Toxicity/non-target organisms
Microorganisms, 81-0648

Chwastox D
see MCPA

Cismethrin
Lung
Animals/experimental, 81-0537
Toxicity/experimental organisms
Rat, 81-0537

Clonitralide
see Molluscicides

CNP
see also Substituted aromatic herbicides
Blood cells
Animals/experimental, 81-0800
Toxicity/experimental organisms
Rabbit, 81-0800

Copper oxychloride
see also Inorganic fungicides
Enzyme activity
Peroxidase, 81-0555
Nervous system
Animals/experimental, 81-0203
Phytotoxicity
Crops, 81-0309
Reproduction/growth
Animals/experimental, 81-0203
Respiratory system
Animals/experimental, 81-0203
Toxicity/experimental organisms
Fish, 81-0203, 81-0555

Copper sulfate
see also Inorganic fungicides
Monitoring devices/programs
Water, 81-0438
Nervous system
Animals/experimental, 81-0203
Phytotoxicity
Aquatics, 81-0438
Reproduction/growth
Animals/experimental, 81-0203
Respiratory system
Animals/experimental, 81-0203
Toxicity/experimental organisms
Fish, 81-0203
Toxicity/non-target organisms
Microorganisms, 81-0438

Cyanazine
see also Triazine herbicides
Cell membranes
Plants, 81-0334
Factors influencing metabolism/toxicity
Geographic location, 81-0053
Phytotoxicity
Crops, 81-0053
Residue dynamics, 81-0673

Cyanofenphos
see also Organophosphates
Nervous system
Animals/experimental, 81-0798
Polyneuritis
Animals/experimental, 81-0798
Toxicity/experimental organisms
Chicken, 81-0798

Cyanophos
Enzyme activity
Cholinesterase, 81-0468
Toxicity/experimental organisms
Chicken, 81-0468

1,3-D
see also Nematicides
Phytotoxicity
Crops, 81-0655
Residues/soil
General, 81-0655
Toxicity/non-target organisms
Microorganisms, 81-0655

2,4-D
see also Phenoxy acids
Amino acids/peptides/proteins

2,4-D (cont'd)
Plants, 81-0301
Analysis
Sample preparation, 81-0271
Behavior
Animals/experimental, 81-0162
81-0534
Bioassay, 81-0157
Carcinogenesis
Human, 81-0348
Chromatography
Gas-liquid, 81-0271, 81-0871
Environmental pollution, 81-0623
Enzyme activity
General, 81-0046
Enzyme assay
Cholinesterase, 81-0856
Excretion
In vitro, 81-0765
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0301
Geographic location, 81-0053
Interactions, 81-0325, 81-0369
Growth
Plants, 81-0558
Metabolism
In vitro, 81-0046
Mitochondria
In vitro, 81-0472
Monitoring devices/programs
81-0871
Mutagenesis
Animals/experimental, 81-0199
Phytotoxicity
Aquatics, 81-0558
Crops, 81-0053, 81-0301, 81-0321
Prevention
Decontamination, 81-0448
Reproduction cycle
Animals/experimental, 81-0534
Residue degradation
In vitro, 81-0448
Soil, 81-0403
Water, 81-0440, 81-0441
Residues/food and feed
Animal feed, 81-0271
Cereals, 81-0271
Residues/soil
Adsorption, 81-0403
Movement, 81-0403
Persistence, 81-0422
Residues/water
Rivers/streams, 81-0440, 81-0441
Respiration, cellular
In vitro, 81-0472
Reviews
Toxicology and pharmacology
81-0349
Teratogenesis
Human, 81-0462
Toxicity/experimental organisms
Annelids, 81-0157
Fish, 81-0162, 81-0534, 81-0848
Insects, 81-0848
Mouse, 81-0182
Plants, 81-0558

2,4-D (cont'd)
Rat, 81-0182
Toxicity/humans
General, 81-0182

Dacthal
Residue degradation
Soil, 81-0102
Residues/soil
General, 81-0102

Daminozide
see also Aliphatic and arylaliphatic acids
Biotransformation
Plankton/algae, 81-0112
Chromatography
Column, 81-0592
Gas-liquid, 81-0423
Residues/food and feed
Fruits, 81-0423
Spectrometry
Atomic absorption/emission 81-0592
Colorimetry, 81-0423
Translocation
Trees/shrubs, 81-0112

DBCP
see also Fumigant insecticides; Nematicides
Biochemical effects
Porphyrins/pigments, 81-0165
Carcinogenesis
General, 81-0457
Animals/experimental, 81-0779
Chromatography
Gas-liquid, 81-0594
Cytological effects
Mitochondria, 81-0165
Environmental pollution, 81-0653
Enzyme activity
δ-Aminolaevulinate synthase 81-0165
Fertility/sterility
General, 81-0777
Human, 81-0514
Laws and regulations
Australia, 81-0052
Morbidity and mortality statistics
USA, 81-0141
USA-Michigan, 81-0454
Mutagenesis
Microorganisms, 81-0740
Nucleic acids
Human, 81-0514
Prevention
General, 81-0052
Disposal, 81-0137
Reproductive organs and hormones, male
Animals/experimental, 81-0839
Human, 81-0141, 81-0454 81-0514
Residues/water
Groundwater/rain, 81-0653
Reviews
Toxicology and pharmacology 81-0777, 81-0779

DBCP (cont'd)
Safety standards
Toxicity rating class, 81-0457
Toxicity/experimental organisms
Rat, 81-0839
Toxicity/humans
Occupational, 81-0141

DCPA
see Dacthal

DDE
see also Organochlorines
Analysis
Sample preparation, 81-0262 81-0278, 81-0864
Biogenic amines
Animals/experimental, 81-0481
Chromatography
General, 81-0278
Gas-liquid, 81-0262
Thin-layer, 81-0559
Eggshell effects
In vitro, 81-0500
Enzyme activity
ATPase, 81-0500
Experimental design
Analysis, 81-0862, 81-0864
Monitoring and residues, 81-0156
Toxicology and pharmacology 81-0156
Factors influencing metabolism/toxicity
Biological magnification, 81-0156
Microsomes
In vitro, 81-0500
Mitochondria
In vitro, 81-0500
Plants, 81-0478
Phytotoxicity
Crops, 81-0478
Residues/air
Agricultural, 81-0862
Residues/food and feed
Fish, 81-0661
Meat, 81-0682
Residues/humans
Adipose, 81-0378
Blood, 81-0669
Residues/non-target organisms
Birds, 81-0395, 81-0528, 81-0748
Duck, 81-0418, 81-0647
Eggs, 81-0395, 81-0418, 81-0528
Fish, 81-0416, 81-0645, 81-0661
Invertebrates, 81-0645
Molluscs, 81-0415
Reptiles, 81-0413
Residues/soil
Sediment, 81-0276
Respiration, cellular
In vitro, 81-0500
Plants, 81-0478
Toxicity/non-target organisms
Birds, 81-0528
Eggs, 81-0528

DDT
see also Organochlorines
Amino acids/peptides/proteins

DDT (cont'd)
Animals/experimental, 81-0220
Analysis
Sample preparation, 81-0260 81-0270
Beneficial effects, 81-0039
Bioassay, 81-0157
Biogenic amines
Animals/experimental, 81-0481
Biotransformation
Microorganisms, 81-0678
Carcinogenesis
General, 81-0198
Animals/experimental, 81-0758
Chromatography
Column, 81-0260
Gas-liquid, 81-0580
HPL, 81-0270
Thin-layer, 81-0559
Distribution/storage
Quail, 81-0538
Eggshell effects
In vitro, 81-0500
Embryo/fetus
Animals/experimental, 81-0538
Environmental pollution, 81-0653 81-0679
Enzyme activity
General, 81-0628
ATPase, 81-0500, 81-0755
Mixed function oxidases, 81-0772
Excretion
In vitro, 81-0765
Experimental design
Analysis, 81-0862
Monitoring and residues, 81-0155
Toxicology and pharmacology 81-0155
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0039 81-0243, 81-0619, 81-0755
Biological magnification, 81-0155 81-0649
Diet, 81-0221
Disease state, 81-0198
Taxon, 81-0758
Growth
Animals/experimental, 81-0221
Laws and regulations
USA, 81-0130
Lipids/steroids/sterols
Animals/experimental, 81-0517
Metabolism
Rat, 81-0221
Microsomes
In vitro, 81-0500
Mitochondria
In vitro, 81-0500
Plants, 81-0478
Models
Environmental, 81-0063, 81-0064
Monitoring devices/programs
Ecosystems, 81-0070
Morbidity and mortality statistics
Germany (DDR), 81-0719
Muscle, striated

DDT (cont'd)
Animals/experimental, 81-0188
Nervous system
Animals/experimental, 81-0203
Human, 81-0196
Phytotoxicity
Crops, 81-0478
Prevention
Decontamination, 81-0448
81-0456
Reproduction/growth
Animals/experimental, 81-0203
81-0802
Residue degradation
General, 81-0456
In vitro, 81-0448, 81-0469
Soil, 81-0678
Water, 81-0678
Residue dynamics, 81-0064
Residues/air
Agricultural, 81-0862
Rural, 81-0679
Residues/food and feed
Total diet, 81-0665
Fish, 81-0118, 81-0661
Meat, 81-0118, 81-0374
Poultry, 81-0118
Residues/humans
Adipose, 81-0378, 81-0702
Blood, 81-0669
Residues/non-target organisms
Annelids, 81-0399
Cow, 81-0409
Crustacea, 81-0412
Duck, 81-0418, 81-0647
Eggs, 81-0418
Fish, 81-0416, 81-0661
Molluscs, 81-0412, 81-0417
Reptiles, 81-0413, 81-0649
Residues/plants
General, 81-0121
Crops, 81-0429, 81-0431
Herbs, medicinals/condiments
81-0058
Tobacco, 81-0431
Residues/soil
General, 81-0121
Adsorption, 81-0439, 81-0646
81-0660, 81-0692
Movement, 81-0646, 81-0660
Persistence, 81-0399, 81-0429
81-0431
Sediment, 81-0439
Soil types, 81-0646
Volatilization, 81-0064
Residues/water
Groundwater/rain, 81-0653
81-0679
Oceans/seas, 81-0412
Sediment, 81-0412
Respiration, cellular
In vitro, 81-0500
Plants, 81-0478
Respiratory system
Animals/experimental, 81-0203
Reviews
General, 81-0818

DDT (cont'd)
Toxicology and pharmacology
81-0772
Spectrometry
Mass spectrometry, 81-0580
Radiometry, 81-0270
Teratogenesis
Animals/experimental, 81-0802
Toxicity/experimental organisms
Amphibians, 81-0188
Annelids, 81-0157
Birds, 81-0802
Fish, 81-0203
In vitro, 81-0220
Microorganisms, 81-0243
Molluscs, 81-0206
Monkey, 81-0517
Rat, 81-0220, 81-0221
Toxicity/humans
General, 81-0196
Toxicity/non-target organisms
Birds, 81-0399
Vitamins/coenzymes
In vitro, 81-0469

DDT derived compounds
see also Organochlorines
Chromatography
Gas-liquid, 81-0574
Thin-layer, 81-0559
Kidney
In vitro, 81-0770
Residues/food and feed
Fish, 81-0118
Meat, 81-0118
Poultry, 81-0118
Residues/plants
Herbs, medicinals/condiments
81-0057
Residues/soil
Persistence, 81-0675
Soil types, 81-0675
Spectrometry
Mass spectrometry, 81-0574

DDT isomers
see also Organochlorines
Residues/food and feed
Meat, 81-0682
Residues/non-target organisms
Fish, 81-0416
Residues/plants
Herbs, medicinals/condiments
81-0057
Tobacco, 81-0379, 81-0381

DDVP
see Dichlorvos

Decamethrin
see also Pyrethrins
Beneficial effects, 81-0039

Deet
see also Repellents
Absorption
Dog, 81-0531
Carbohydrates
Animals/experimental, 81-0844
Electrolytes

Deet (cont'd)
Animals/experimental, 81-0844
Excretion
Dog, 81-0531
Growth
Animals/experimental, 81-0844
Lipids/steroids/sterols
Animals/experimental, 81-0844
Toxicity/experimental organisms
Rabbit, 81-0844

DEF
see also Organophosphates
Residues/air
Agricultural, 81-0397
Toxicity/humans
Occupational, 81-0397

DEHP
see Dioctyl phthalate

Demephion
see also Organophosphates
Prevention
Disposal, 81-0717

Demeton
see also Organophosphates
Carcinogenesis
General, 81-0776
Monitoring devices/programs
Water, 81-0684
Mutagenesis
General, 81-0776
Reviews
Toxicology and pharmacology
81-0776

Demeton-*S*-methyl
see also Organophosphates
Prevention
Disposal, 81-0717

Demeton-O-methyl
see also Organophosphates
Toxicity/experimental organisms
Fish, 81-0504

Desmetryne
see also Triazine herbicides
Residues/plants
Herbs, medicinals/condiments
81-0116

DFP
see also Organophosphates
Amino acids/peptides/proteins
In vitro, 81-0769
Cytological effects
In vitro, 81-0769
Musculoskeletal system
Animals/experimental, 81-0532
Nervous system
Animals/experimental, 81-0532
In vitro, 81-0551, 81-0769
Spinal cord
Animals/experimental, 81-0552
In vitro, 81-0552

DFP (cont'd)
Toxicity/experimental organisms
Cat, 81-0532

Di-allate
see also Thiocarbamate herbicides
Carcinogenesis
Animals/experimental, 81-0544
Factors influencing metabolism/toxicity
General, 81-0544
Mutagenesis
General, 81-0778
Reviews
Toxicology and pharmacology 81-0778

Dialene
Amino acids/peptides/proteins
Plants, 81-0642
Metabolism
Plants, 81-0642
Phytotoxicity
Crops, 81-0642

Dialifor
see also Organophosphates
Morbidity and mortality statistics
USA, 81-0087
Residue degradation
General, 81-0087
Residue dynamics, 81-0087
Residues/plants
Crops, 81-0087

Diazinon
see also Organophosphates
Absorption
Annelids, 81-0236
Analysis
General, 81-0282
Behavior
Animals/experimental, 81-0787
Enzyme activity
Cholinesterase, 81-0747
Enzyme assay
Cholinesterase, 81-0567
Factors influencing metabolism/toxicity
General, 81-0787
Diet, 81-0747
Monitoring devices/programs 81-0667
Residue degradation
Plants, 81-0385
Residue dynamics, 81-0115, 81-0385
Residues/food and feed
Vegetables, 81-0115
Residues/plants
Crops, 81-0385
Toxicity/experimental organisms
Pheasant, 81-0787

Dibromochloropropane
see DBCP

Dicamba
see also Substituted aromatic herbicides
Amino acids/peptides/proteins
Plants, 81-0301
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0301
Phytotoxicity
Crops, 81-0301

Dicarboximides
see Captafol; Captan; Folpet; Fungicides

Dichlobenil
see also Substituted nitriles
Enzyme activity
General, 81-0046, 81-0048
Metabolism
In vitro, 81-0046

3,4-Dichloroaniline
see also Substituted amines
Chromatography
Thin-layer, 81-0589
Photodecomposition, 81-0084
Reproduction/growth
Animals/experimental, 81-0505
Toxicity/experimental organisms
Polychaetes, 81-0505

***o*-Dichlorobenzene**
see also Fumigant insecticides
Chromatography
Gas-liquid, 81-0293

3,4-Dichlorophenylurea
Absorption
Annelids, 81-0236

Dichlorvos
see also Organophosphates
Biochemical effects
General, 81-0172
Brain
Animals/experimental, 81-0496
Chromatography
Thin-layer, 81-0598
Electrolytes
In vitro, 81-0568
Enzyme activity
General, 81-0172
Cholinesterase, 81-0465, 81-0774
Esterases, 81-0151
Factors influencing metabolism/toxicity
Age, 81-0509
Interactions, 81-0151
Nutritional state, 81-0465
Hormones
Animals/experimental, 81-0541
Lipids/steroids/sterols
Animals/experimental, 81-0496
Metabolism
General, 81-0172
Monitoring devices/programs
Water, 81-0684
Mutagenesis
General, 81-0172
Prevention
Protective equipment, 81-0715
Residue removal
Food and feed, 81-0104
Respiration, cellular
Animals/experimental, 81-0509
Reviews
Toxicology and pharmacology 81-0774
Thyroid
Animals/experimental, 81-0541
Toxicity/experimental organisms
Rabbit, 81-0774

Diclofop-methyl
see also Phenoxy acids
Factors influencing metabolism/toxicity
Interactions, 81-0369
Metabolism
Plants, 81-0034, 81-0369
Phytotoxicity
Crops, 81-0034
Translocation
Crops, 81-0034

Dicloran
see Substituted aromatic fungicides

Dicofol
see also Organochlorines
Carcinogenesis
Animals/experimental, 81-0779
Chromatography
HPL, 81-0583
Residue dynamics, 81-0115
Residues/food and feed
Vegetables, 81-0115
Residues/soil
Adsorption, 81-0692
Reviews
Toxicology and pharmacology 81-0779

Dicrotophos
see also Organophosphates
Amino acids/peptides/proteins
In vitro, 81-0769
Cytological effects
In vitro, 81-0769
Enzyme activity
Cholinesterase, 81-0774
Nervous system
In vitro, 81-0769
Residues/humans
Blood, 81-0691
Organs, 81-0691
Urine, 81-0691
Reviews
Toxicology and pharmacology 81-0774
Toxicity/experimental organisms
Rabbit, 81-0774
Toxicity/humans
General, 81-0691

Dicuran
see Chlortoluron

Dieldrin
see also Organochlorines
Absorption

Dieldrin (cont'd)
Annelids, 81-0236
Monkey, 81-0255
Mouse, 81-0255
Rabbit, 81-0255
Rat, 81-0255
Analysis
Sample preparation, 81-0300
Bioassay, 81-0436
Biogenic amines
Animals/experimental, 81-0481
Biotransformation
In vitro, 81-0764
Carcinogenesis
General, 81-0777
Animals/experimental, 81-0186
Cartilage
Animals/experimental, 81-0153
Chromatography
Gas-liquid, 81-0300
Distribution/storage
Monkey, 81-0255
Mouse, 81-0153, 81-0255
Rabbit, 81-0255
Rat, 81-0255
Environmental pollution, 81-0679
Enzyme activity
Mixed function oxidases, 81-0764 81-0772
Excretion
Monkey, 81-0255
Mouse, 81-0255
Rabbit, 81-0255
Rat, 81-0255
Experimental design
Analysis, 81-0862
Factors influencing metabolism/ toxicity
Biological magnification, 81-0649
Diet, 81-0746
Sex, 81-0746
Laws and regulations
USA-NIOSH, 81-0738
Liver
Animals/experimental, 81-0186 81-0502
Metabolism
Monkey, 81-0255
Mouse, 81-0255
Quail, 81-0746
Rabbit, 81-0255
Rat, 81-0255
Monitoring devices/programs
Ecosystems, 81-0070
Nucleic acids
Animals/experimental, 81-0502
Reproduction/growth
Animals/experimental, 81-0505
Residue degradation
Soil, 81-0080
Residues/air
Agricultural, 81-0862
Rural, 81-0679
Residues/food and feed
Total diet, 81-0665
Meat, 81-0374, 81-0682
Vegetables, 81-0078, 81-0079

Dieldrin (cont'd)
Residues/non-target organisms
Annelids, 81-0399
Birds, 81-0748
Crustacea, 81-0412
Duck, 81-0418
Eggs, 81-0418
Molluscs, 81-0412
Reptiles, 81-0413, 81-0649
Residues/plants
Crops, 81-0431
Tobacco, 81-0381, 81-0431
Residues/soil
Adsorption, 81-0439
Persistence, 81-0399, 81-0431
Sediment, 81-0439
Soil types, 81-0080
Residues/water
Groundwater/rain, 81-0679
Oceans/seas, 81-0412
Rivers/streams, 81-0436
Sediment, 81-0412
Reviews
General, 81-0812
Epidemiology, prevention, and treatment, 81-0738
Toxicology and pharmacology 81-0772, 81-0777
Safety standards
General, 81-0738
Toxicity/experimental organisms
Polychaetes, 81-0505
Rat, 81-0186
Toxicity/non-target organisms
Birds, 81-0399
Diethatyl-ethyl
see Substituted amines
Amino acids/peptides/proteins
In vitro, 81-0033
Diethyldithiocarbamic acid
Enzyme activity
General, 81-0249
Liver
Animals/experimental, 81-0249
Diflubenzuron
see also Insect hormones and analogs
Alternative controls, 81-0030
Chromatography
General, 81-0345
Factors influencing metabolism/ toxicity
Adaptation/resistance, 81-0359
Age, 81-0343
Reproduction/growth
Animals/experimental, 81-0163
Residues/soil
Adsorption, 81-0439
Sediment, 81-0439
Toxicity/experimental organisms
Crustacea, 81-0163
Dikegulac
Phytotoxicity
Trees/shrubs, 81-0318
Dimethoate
see also Organophosphates
Carcinogenesis

Dimethoate (cont'd)
Animals/experimental, 81-0779
Chromatography
Gas-liquid, 81-0295
HPL, 81-0861
Thin-layer, 81-0861
Experimental design
Analysis, 81-0861
Mutagenesis
Animals/experimental, 81-0199
Prevention
Disposal, 81-0717
Protective equipment, 81-0707
Reviews
Toxicology and pharmacology 81-0779
Toxicity/experimental organisms
Annelids, 81-0763
Dimilin
see Diflubenzuron
Dinitramine
see also Substituted amines
Models
Mathematical, 81-0442
Residue degradation
Soil, 81-0442
Residues/soil
Persistence, 81-0442
Dinocap
see also Substituted aromatic fungicides
Electrolytes
In vitro, 81-0568
Growth
Animals/experimental, 81-0479
Reproduction/growth
Animals/experimental, 81-0479
Residue degradation
Food and feed, 81-0383
Residue dynamics, 81-0383
Dinoseb
see also Substituted aromatic herbicides
Absorption
Human, 81-0733
Electron transport
Plants, 81-0023
Enzyme activity
General, 81-0046
ATPase, 81-0023
Immunology
Animals/experimental, 81-0846
Metabolism
In vitro, 81-0046
Phytotoxicity
Crops, 81-0023
Prevention
Disposal, 81-0717
Protective equipment, 81-0733
Dinoseb-acetate
see also Substituted aromatic herbicides
Growth
Microorganisms, 81-0743

Dioctyl phthalate
Absorption
Fish, 81-0064
Analysis
General, 81-0263
Models
Environmental, 81-0064
Residue dynamics, 81-0064
Residues/soil
Volatilization, 81-0064
Spectrometry
Mass spectrometry, 81-0263

Dioxacarb
see also Carbamates
Factors influencing metabolism/ toxicity
Route, 81-0785
Safety standards
Toxicity rating class, 81-0785
Toxicity/experimental organisms
Rat, 81-0785

Dioxins
Analysis
Sample preparation, 81-0602
Biochemical effects
Mouse, 81-0610
Biotransformation
Hamster, 81-0362
Carcinogenesis
General, 81-0356, 81-0457 81-0777
Animals/experimental, 81-0805
Human, 81-0452
Chromatography
Gas-liquid, 81-0328, 81-0569
HPL, 81-0289
Liquid, 81-0602
Distribution/storage
Hamster, 81-0362
Environmental pollution, 81-0124 81-0307, 81-0327, 81-0623 81-0722
Enzyme activity
General, 81-0226
Excretion
Hamster, 81-0362
Experimental design
Epidemiology, prevention, and treatment, 81-0124
Toxicology and pharmacology 81-0124
Factors influencing metabolism/ toxicity
Formulation, 81-0335
Nutritional state, 81-0226
Route, 81-0335
Fertility/sterility
Human, 81-0695
Laws and regulations
USA, 81-0130
Liver
Animals/experimental, 81-0226
Marrow
Animals/experimental, 81-0613
Morbidity and mortality statistics
Czechoslovakia, 81-0049

Dioxins (cont'd)
Germany (BRD), 81-0149
USA, 81-0722
USA-Michigan, 81-0695
Mutagenesis
General, 81-0777
Phagocytes
Animals/experimental, 81-0613
Porphyrins/pigments
Animals/experimental, 81-0338
Human, 81-0337
Prevention
Decontamination, 81-0129 81-0330, 81-0331
Disposal, 81-0137
Reproduction/growth
Human, 81-0695
Residue removal
Soil, 81-0331
Residues/air
Rural, 81-0333
Residues/humans
General, 81-0722
Milk, 81-0602
Residues/non-target organisms
General, 81-0722
Residues/soil
General, 81-0329
Adsorption, 81-0331
Persistence, 81-0332
Reviews
Analysis, 81-0328, 81-0346
Epidemiology, prevention, and treatment, 81-0722
Monitoring and residues, 81-0346
Toxicology and pharmacology 81-0349, 81-0777
Safety standards
Toxicity rating class, 81-0457
Skin
Human, 81-0149, 81-0721
Spectrometry
Mass spectrometry, 81-0328 81-0569, 81-0602
Teratogenesis
Human, 81-0452
Toxicity/experimental organisms
General, 81-0124
Monkey, 81-0623, 81-0804
Mouse, 81-0226, 81-0613
Rat, 81-0623
Toxicity/humans
General, 81-0623, 81-0695
Accidental, 81-0721
Occupational, 81-0049, 81-0149
Toxicity/non-target organisms
General, 81-0124

Diphacinone
see also Rodenticides
Chromatography
Thin-layer, 81-0860
Spectrometry
Fluorometry, 81-0860

Diphenamid
see also Substituted amines
Enzyme activity

Diphenamid (cont'd)
General, 81-0046
Metabolism
In vitro, 81-0046

Dipterex
see Trichlorfon

Dipyridylphosphate
see also Herbicides
Factors influencing metabolism/ toxicity
Route, 81-0698
Safety standards
TLV/MAC, 81-0698
Toxicity/experimental organisms
Mouse, 81-0698
Rabbit, 81-0698
Rat, 81-0698

Diquat
see also Bipyridyliums
Absorption
In vitro, 81-0742
Lung
In vitro, 81-0742
Mutagenesis
Animals/experimental, 81-0482
Nervous system
Human, 81-0228
Residues/soil
Adsorption, 81-0660
Teratogenesis
Animals/experimental, 81-0482
Toxicity/humans
General, 81-0228

Disulfiram
see also Dithiocarbamates
Enzyme activity
General, 81-0249
Factors influencing metabolism/ toxicity
Interactions, 81-0252
Liver
Animals/experimental, 81-0249
In vitro, 81-0252
Porphyrins/pigments
In vitro, 81-0252
Toxicity/experimental organisms
Rat, 81-0249

Disulfoton
see also Organophosphates
Blood cells
Animals/experimental, 81-0800
Residues/plants
Tobacco, 81-0380
Residues/soil
Persistence, 81-0380
Toxicity/experimental organisms
Rabbit, 81-0800

Dithane S-60
see Mancozeb

Dithane Z-78
see Zineb

Dithianon
see also Quinones
Chromatography
HPL, 81-0874
Spectrometry
Colorimetry, 81-0874

Dithiocarbamates
see also Disulfiram; Ferbam; Fungicides; Mancozeb; Maneb; Thiophanate-methyl; Thiram; Zineb Ziram
Carcinogenesis
Animals/experimental, 81-0199
Chromatography
Liquid, 81-0857
Embryo/fetus
Animals/experimental, 81-0199
Placental transfer
Animals/experimental, 81-0199
Prevention
Decontamination, 81-0129
Residue dynamics, 81-0115
Residues/food and feed
Total diet, 81-0665
Vegetables, 81-0115

Diuron
see also Substituted ureas
Cell membranes
In vitro, 81-0354
Chromatography
Gas-liquid, 81-0261
HPL, 81-0261
Factors influencing metabolism/toxicity
Geographic location, 81-0053
Phytotoxicity
Crops, 81-0053

DMDT
see Methoxychlor

DNOC
see also Substituted aromatic fungicides; Substituted aromatic herbicides
Morbidity and mortality statistics
Germany (DDR), 81-0719
Prevention
Disposal, 81-0717
Reviews
General, 81-0828
Toxicity/experimental organisms
Annelids, 81-0763

Dodine
see also Aliphatic and alicyclic nitrogen compounds
Growth
Microorganisms, 81-0743

Dowco-275
Absorption
Annelids, 81-0236

DPX-3217
see also Aliphatic and alicyclic nitrogen compounds
Biotransformation
Plankton/algae, 81-0092

Edifenphos
see also Organophosphate fungicides
Biochemical effects
Human, 81-0796
Nervous system
Human, 81-0796
Residues/humans
Blood, 81-0666
Urine, 81-0666
Toxicity/humans
Accidental, 81-0796
Occupational, 81-0666

Endosulfan
see also Organochlorines
Analysis
Sample preparation, 81-0863
Environmental pollution, 81-0022
Nervous system
Animals/experimental, 81-0203
Reproduction/growth
Animals/experimental, 81-0203
Residue degradation
Soil, 81-0090
Residue removal
Food and feed, 81-0426
Residues/food and feed
Cereals, 81-0426
Residues/plants
Crops, 81-0426, 81-0431
Tobacco, 81-0381, 81-0431
Residues/soil
Persistence, 81-0090, 81-0431
Respiratory system
Animals/experimental, 81-0203
Reviews
General, 81-0821
Toxicity/experimental organisms
Fish, 81-0203

Endothall
Toxicity/experimental organisms
Fish, 81-0487

Endrin
see also Organochlorines
Enzyme activity
General, 81-0232
Cholinesterase, 81-0232
Esterases, 81-0232
Experimental design
Analysis, 81-0862
Lipids/steroids/sterols
Animals/experimental, 81-0507
Metabolism
In vitro, 81-0232
Reproduction cycle
Animals/experimental, 81-0507
Residue degradation
Soil, 81-0080
Residues/air
Agricultural, 81-0862
Residues/food and feed
Meat, 81-0682
Vegetables, 81-0079
Residues/plants
Tobacco, 81-0381
Residues/soil
Soil types, 81-0080

Endrin (cont'd)
Reviews
General, 81-0822
Toxicity/experimental organisms
Amphibians, 81-0508

EPN
see also Organophosphates
Enzyme activity
General, 81-0232
Cholinesterase, 81-0232, 81-0468
Esterases, 81-0232
Lipids/steroids/sterols
In vitro, 81-0232
Metabolism
In vitro, 81-0232
Polyneuritis
Animals/experimental, 81-0775
Human, 81-0775
Reviews
Toxicology and pharmacology 81-0775
Toxicity/experimental organisms
Chicken, 81-0468

EPTC
see also Thiocarbamate herbicides
Amino acids/peptides/proteins
In vitro, 81-0033
Factors influencing metabolism/toxicity
Formulation, 81-0364
Residues/plants
Crops, 81-0364

Ethephon
see also Aliphatic and arylaliphatic acids
Enzyme activity
General, 81-0031
Phytotoxicity
Trees/shrubs, 81-0031

Ethirimol
see Aliphatic and alicyclic nitrogen compounds

Ethoprop
see also Aliphatic and arylaliphatic acids; Organophosphates
Morbidity and mortality statistics
USA-Tennessee, 81-0736
Prevention
Protective equipment, 81-0736
Residues/plants
Tobacco, 81-0380
Residues/soil
Persistence, 81-0380
Toxicity/humans
Accidental, 81-0736

Ethyl formate
see also Fumigant insecticides
Phytotoxicity
Crops, 81-0617

Ethylene dibromide
see also Fumigant insecticides
Amino acids/peptides/proteins
Animals/experimental, 81-0751
Biotransformation

Ethylene dibromide (cont'd)
Microorganisms, 81-0751
Rat, 81-0751
Carcinogenesis
General, 81-0457
Animals/experimental, 81-0779
Chromatography
Gas-liquid, 81-0275, 81-0593
Mitosis/meiosis
In vitro, 81-0490
Mutagenesis
Animals/experimental, 81-0751
Microorganisms, 81-0740, 81-0751
Nucleic acids
In vitro, 81-0490
Prevention
Protective equipment, 81-0453
Residues/air
Industrial, 81-0453
Reviews
Toxicology and pharmacology 81-0741, 81-0779
Safety standards
TLV/MAC, 81-0453
Toxicity rating class, 81-0457

Ethylene dichloride
see also Fumigant insecticides
Chromatography
Gas-liquid, 81-0293
Prevention
General, 81-0713
Residues/air
Industrial, 81-0688
Reviews
Analysis, 81-0638
Epidemiology, prevention, and treatment, 81-0638
Monitoring and residues, 81-0638
Toxicology and pharmacology 81-0638

Ethylene oxide
see also Fumigant insecticides
Mutagenesis
Animals/experimental, 81-0535
Teratogenesis
Animals/experimental, 81-0547
Toxicity/humans
Occupational, 81-0131

Ethylene thiourea
Chromatography
HPL, 81-0576
Models
Pharmacology, 81-0761
Prevention
Decontamination, 81-0129
Toxicity/experimental organisms
General, 81-0761

Ethylmercuric chloride
Phytotoxicity
Crops, 81-0309

Etisazole
Skin
Human, 81-0494

Etridiazol
see also Thiazoles
Toxicity/experimental organisms
Dog, 81-0840
Rabbit, 81-0840
Rat, 81-0840

Fenamiphos
see also Organophosphates
Absorption
Annelids, 81-0236
Monitoring devices/programs
Water, 81-0684

Fenapanil
see also Substituted aromatic fungicides
Distribution/storage
Plants, 81-0025
Phytotoxicity
Crops, 81-0025
Translocation
Crops, 81-0025

Fenarimol
see also Aliphatic and alicyclic nitrogen compounds
Distribution/storage
Plants, 81-0025
Translocation
Crops, 81-0025

Fenitrothion
see also Organophosphates
Alimentary tract
Animals/experimental, 81-0204
Blood cells
Animals/experimental, 81-0800
Brain
Animals/experimental, 81-0250
Chromatography
Thin-layer, 81-0598
Enzyme activity
General, 81-0232, 81-0250
Cholinesterase, 81-0232, 81-0468 81-0512, 81-0728
Esterases, 81-0232
Experimental design
Toxicology and pharmacology 81-0784
Kidney
Animals/experimental, 81-0204 81-0250
Lipids/steroids/sterols
In vitro, 81-0232
Liver
Animals/experimental, 81-0204 81-0250
Metabolism
In vitro, 81-0232
Reproduction/growth
Animals/experimental, 81-0784
Plants, 81-0020
Residue removal
Food and feed, 81-0426, 81-0671
Residues/air
Agricultural, 81-0107
Rural, 81-0107
Residues/food and feed
Cereals, 81-0426
Residues/plants
Crops, 81-0426
Respiration, cellular
Animals/experimental, 81-0512
Toxicity/experimental organisms
Chicken, 81-0468
Fish, 81-0204, 81-0784
Rabbit, 81-0800
Rat, 81-0250
Toxicity/humans
Occupational, 81-0728
Toxicity/non-target organisms
Plants, 81-0020

Fensulfothion
see also Organophosphates
Analysis
General, 81-0285
Residues/food and feed
Vegetables, 81-0285

Fenthion
see also Organophosphates
Biochemical effects
Human, 81-0796
Chromatography
Gas-liquid, 81-0297
Monitoring devices/programs
Water, 81-0684
Nervous system
Human, 81-0796
Residues/humans
Blood, 81-0666
Urine, 81-0666
Spectrometry
Mass spectrometry, 81-0297
Toxicity/humans
Accidental, 81-0796
Occupational, 81-0666

Fentrifanil
Cytological effects
Mitochondria, 81-0164

Fenuron
see also Substituted ureas
Absorption
Annelids, 81-0236
Chromatography
Gas-liquid, 81-0599
Residues/soil
Adsorption, 81-0680

Fenvalerate
see also Pyrethrins
Chromatography
HPL, 81-0274
Factors influencing metabolism/toxicity
Structure/function, 81-0806
Spectrometry
NMR, 81-0806
Toxicity/experimental organisms
Rat, 81-0806

Ferbam
see also Dithiocarbamates
Thyroid

Ferbam (cont'd)
Animals/experimental, 81-0242
Toxicity/experimental organisms
Rat, 81-0242

Fluometuron
see also Substituted ureas
Titration, 81-0900

Flurecol-butyl
see also Substituted aromatic herbicides
Chromatography
HPL, 81-0861
Thin-layer, 81-0861
Experimental design
Analysis, 81-0861

Fluridone
see also Nitrogen heterocyclic herbicides
Chromatography
Gas-liquid, 81-0585

FMC-31768
see also Carbamates
Residue degradation
Soil, 81-0094

FMC-35001
see also Carbamates
Residue degradation
Soil, 81-0093

Folpet
see also Dicarboximides
Absorption
Annelids, 81-0236
Carcinogenesis
General, 81-0776
Mutagenesis
General, 81-0776
Reviews
Toxicology and pharmacology 81-0776

Fumigant insecticides
see also Acenaphthene; Acetaldehyde; Acrylonitrile; Camphor; Chloropicrin; DBCP;*o*-Dichlorobenzene; Ethyl formate; Ethylene dibromide; Ethylene dichloride; Ethylene oxide; Hydrogen cyanide; Insecticides; Methyl bromide; Methylene chloride; Naphthalene
Chromatography
Gas-liquid, 81-0880
Experimental design
Monitoring and residues, 81-0880
Reviews
General, 81-0815, 81-0819

Fumigants
Chromatography
Gas-liquid, 81-0564
Morbidity and mortality statistics
Hungary, 81-0710
Residues/food and feed
General, 81-0377

Fundazol
Morbidity and mortality statistics
Bulgaria, 81-0133
Skin
Human, 81-0132, 81-0133
Toxicity/humans
Occupational, 81-0132, 81-0133

Fungi
Alternative controls, 81-0316

Fungicides
see also Aliphatic and alicyclic nitrogen compounds; Benzimidazoles; Dicarboximides; Dithiocarbamates; Inorganic fungicides; Organomercury fungicides; Organophosphate fungicides; Organotin fungicides; Oxathiines; Quinones; Substituted aromatic fungicides Thiazoles
Analysis
Sample preparation, 81-0881
Bioassay, 81-0597
Chromatography
Gas-liquid, 81-0881
HPL, 81-0859
Chromosomes/genes
Microorganisms, 81-0229
Enzyme assay
General, 81-0600
Experimental design
Toxicology and pharmacology 81-0055
Factors influencing metabolism/toxicity
Interactions, 81-0218
Mitosis/meiosis
Microorganisms, 81-0229
Morbidity and mortality statistics
Hungary, 81-0710
Phytotoxicity
General, 81-0218
Prevention
Disposal, 81-0624
Reviews
Toxicology and pharmacology 81-0614
Spectrometry
Fluorometry, 81-0859
Toxicity/experimental organisms
Mammals, 81-0304
Microorganisms, 81-0229

Furadan
see Carbofuran

Gambusia affinis
Alternative controls, 81-0313

Gardonna
see Tetrachlorvinphos

Gibberellic acid
Phytotoxicity
Crops, 81-0616

Glyphosate
see also Substituted amines
Cell membranes

Glyphosate (cont'd)
Plants, 81-0368
Chromatography
HPL, 81-0292
Embryo/fetus
Animals/experimental, 81-0489
Phytotoxicity
Crops, 81-0016
Residues/soil
Persistence, 81-0404
Residues/water
Runoff/irrigation ditches, 81-0404
Toxicity/experimental organisms
Birds, 81-0489
Translocation
Crops, 81-0016

Gossyplure
Alternative controls, 81-0054

Guthion
see Azinphosmethyl

H-22234
see Dethatyl-ethyl

HCB
see Hexachlorobenzene

Heavy metals
Distribution/storage
Molluscs, 81-0161
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0159
Biological magnification, 81-0161
Interactions, 81-0161
Mutagenesis
In vitro, 81-0834
Toxicity/experimental organisms
Microorganisms, 81-0159
Molluscs, 81-0161

Heptachlor
see also Organochlorines
Biotransformation
General, 81-0773
Microorganisms, 81-0678
Distribution/storage
General, 81-0773
Enzyme activity
Carboxylase, 81-0525
Mixed function oxidases, 81-0772
Experimental design
Analysis, 81-0862
Porphyrins/pigments
Animals/experimental, 81-0525
Residue degradation
Soil, 81-0678
Water, 81-0678
Residues/air
Agricultural, 81-0862
Residues/food and feed
Total diet, 81-0665
Residues/non-target organisms
Annelids, 81-0399
Residues/soil
Adsorption, 81-0439
Persistence, 81-0399
Sediment, 81-0439

Heptachlor (cont'd)
Reviews
General, 81-0824
Toxicology and pharmacology 81-0772, 81-0773
Toxicity/non-target organisms
Birds, 81-0399

Heptachlor epoxide
see also Organochlorines
Residues/food and feed
Total diet, 81-0665
Residues/non-target organisms
Duck, 81-0418
Eggs, 81-0418

Herbicides
see also Aliphatic and arylaliphatic acids; Bipyridyliums; Carbamate herbicides; Dipyridylphosphate; Meturin; Nitroanilines; Nitrogen heterocyclic herbicides; Organic arsenicals; Phenoxy acids; Substituted amines; Substituted aromatic herbicides; Substituted nitriles; Substituted ureas; Thiocarbamate herbicides; Triazine herbicides; Uracils
Absorption
Plants, 81-0353
Alternative controls, 81-0032
Bioassay, 81-0597
Carcinogenesis
Human, 81-0450
Chromatography
Column, 81-0562
Gas-liquid, 81-0562
HPL, 81-0859
Liquid, 81-0857
Chromosomes/genes
Human, 81-0711
Enzyme activity
Mixed function oxidases, 81-0772
Experimental design
Epidemiology, prevention, and treatment, 81-0051
Toxicology and pharmacology 81-0055
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0353
Interactions, 81-0311
Immunology
Human, 81-0719
Lipids/steroids/sterols
Plants, 81-0018
Metabolism
Plants, 81-0353
Models
Analysis, 81-0306
Morbidity and mortality statistics
Australia, 81-0051
Hungary, 81-0710
Vietnam, 81-0051
Phytotoxicity
Crops, 81-0018, 81-0311
Forest, 81-0302

Herbicides (cont'd)
Trees/shrubs, 81-0302
Prevention
Disposal, 81-0624
Protective practices, 81-0711
Residue degradation
General, 81-0430
Residues/air
Industrial, 81-0711
Residues/plants
Herbs, medicinals/condiments 81-0445
Residues/soil
General, 81-0074, 81-0120
Residues/water
Runoff/irrigation ditches, 81-0074
Reviews
Toxicology and pharmacology 81-0772
Spectrometry
Fluorometry, 81-0859
Toxicity/experimental organisms
Fish, 81-0487
Toxicity/humans
Occupational, 81-0450
Translocation
Crops, 81-0353

Hexachlorobenzene
see also Substituted aromatic fungicides
Absorption
Annelids, 81-0236
Fish, 81-0064
Analysis
Sample preparation, 81-0262 81-0873
Carcinogenesis
Animals/experimental, 81-0513
Chromatography
Gas-liquid, 81-0257, 81-0262 81-0287, 81-0580, 81-0596 81-0873
Environmental pollution, 81-0679
Enzyme activity
General, 81-0226
Factors influencing metabolism/toxicity
Biological magnification, 81-0184
Interactions, 81-0254, 81-0520 81-0522, 81-0523, 81-0524
Nutritional state, 81-0226
Liver, 81-0239
Animals/experimental, 81-0226
Human, 81-0239
Metabolism
General, 81-0513
Models
Environmental, 81-0064
Porphyrins/pigments
Animals/experimental, 81-0239 81-0520, 81-0521, 81-0522
Human, 81-0239
In vitro, 81-0523, 81-0524
Reproduction/growth
Animals/experimental, 81-0513
Residue dynamics, 81-0064
Residues/air

Hexachlorobenzene (cont'd)
Rural, 81-0679
Residues/food and feed
Total diet, 81-0665
Fish, 81-0118
Meat, 81-0118
Poultry, 81-0118
Vegetables, 81-0117
Residues/non-target organisms
Fish, 81-0645
Invertebrates, 81-0645
Molluscs, 81-0387
Residues/soil
Sediment, 81-0276
Volatilization, 81-0064
Residues/water
Groundwater/rain, 81-0679
Reviews
Toxicology and pharmacology 81-0513, 81-0741
Spectrometry
Mass spectrometry, 81-0580
Toxicity/experimental organisms
Fish, 81-0184
Mouse, 81-0182, 81-0226
Rat, 81-0182, 81-0239, 81-0254
Toxicity/humans
General, 81-0182

Hexachlorobutadiene
Excretion
Rat, 81-0248
Excretory system
Animals/experimental, 81-0248
Growth
Animals/experimental, 81-0248
Metabolism
Rat, 81-0248

Hexazinone
Factors influencing metabolism/toxicity
Geographic location, 81-0053
Phytotoxicity
Crops, 81-0053

Hydrogen cyanide
see also Fumigant insecticides
Prevention
General, 81-0713

Hydroprene
see also Insect hormones and analogs
Liver
In vitro, 81-0195
Metabolism
In vitro, 81-0195

Hydroxyatrazine
see also Triazine herbicides
Enzyme activity
General, 81-0046
Metabolism
In vitro, 81-0046

IBP
see also Organophosphate fungicides
Biotransformation
Plants, 81-0654

IBP (cont'd)
Residue degradation
Soil, 81-0654
Water, 81-0654
Residues/food and feed
Cereals, 81-0654
Residues/water
Runoff/irrigation ditches, 81-0654
Sediment, 81-0654

Inorganic fungicides
see Cadmium chloride; Copper oxychloride; Copper sulfate; Fungicides; Sulfur dioxide

Inorganic insecticides
see Insecticides; Lead arsenate; Phosphine; Sulfur dioxide

Insect hormones and analogs
see also Diflubenzuron; Hydroprene; Insecticides; Methoprene; Methyl eugenol
Alternative controls, 81-0324 81-0340, 81-0341
Bioassay, 81-0597

Insecticides
see also Benzoximate; Botanicals; Carbamates; Chlordimeform; Fumigant insecticides; Inorganic insecticides; Insect hormones and analogs; Microbials; Nematicides; Organochlorines; Organophosphates; Pyrethrins; Repellents; Synergists
Bioassay, 81-0597
Chromatography
HPL, 81-0859
Enzyme assay
General, 81-0237, 81-0600
Experimental design
Toxicology and pharmacology 81-0055
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0359
Interactions, 81-0218, 81-0237 81-0308, 81-0501
Immunology
Human, 81-0719
Lipids/steroids/sterols
Animals/experimental, 81-0519
Marrow
Human, 81-0169
Models
Analysis, 81-0306
Photodecomposition, 81-0390
Prevention
Disposal, 81-0624
Residue degradation
General, 81-0430
Residues/plants
Crops, 81-0446
Safety standards
Reentry time, 81-0446
Spectrometry
Fluorometry, 81-0859
Teratogenesis

Insecticides (cont'd)
Human, 81-0462
Toxicity/experimental organisms
Insects, 81-0352, 81-0501
Rat, 81-0352
Toxicity/humans
Accidental, 81-0463
Treatment of poisoning
Diagnosis, 81-0463

Intox 25
see DDT

Ioxynil
see also Substituted nitriles
Chromatography
HPL, 81-0861
Thin-layer, 81-0861
Experimental design
Analysis, 81-0861
Growth
Microorganisms, 81-0743

Isophos-3
Carcinogenesis
General, 81-0198
Factors influencing metabolism/toxicity
Disease state, 81-0198

Isoprothiolane
Photodecomposition, 81-0372

Isoproturon
see also Substituted ureas
Residue degradation
Soil, 81-0648
Toxicity/non-target organisms
Microorganisms, 81-0648

Isouron
see also Substituted ureas
Factors influencing metabolism/toxicity
Geographic location, 81-0053
Phytotoxicity
Crops, 81-0053

Kalixin
Embryo/fetus
General, 81-0198
Teratogenesis
General, 81-0198

Kelthane
see Dicofol

Kepone
see Chlordecone

Klorinol
see TCPE

Kortox 50
see Cartap; Lindane

Kotoran
see Fluometuron

Lead arsenate
see also Inorganic insecticides
Toxicity/humans
Intentional, 81-0791

Lenacil
see also Uracils
Amino acids/peptides/proteins
Plants, 81-0301
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0301
Phytotoxicity
Crops, 81-0301

Leptophos
see also Organophosphates
Distribution/storage
Chicken, 81-0792, 81-0799
Enzyme activity
Cholinesterase, 81-0468
Mitosis/meiosis
Plants, 81-0191
Morbidity and mortality statistics
Egypt, 81-0706
Nervous system
Animals/experimental, 81-0483 81-0792, 81-0799
Phytotoxicity
Cytological effects, 81-0191
Residues/humans
Adipose, 81-0702
Toxicity/experimental organisms
Chicken, 81-0468, 81-0483 81-0799
Toxicity/humans
General, 81-0706
Toxicity/non-target organisms
General, 81-0706

Lindane
see also Organochlorines
Absorption
Fish, 81-0158
Adrenal
Animals/experimental, 81-0180
Amino acids/peptides/proteins
In vitro, 81-0553
Bioassay, 81-0750
Biochemical effects
Biogenic amines, 81-0180
Biotransformation
General, 81-0773
Carcinogenesis
General, 81-0198
Cell membranes
In vitro, 81-0553
Chromatography
Gas-liquid, 81-0298, 81-0570
Thin-layer, 81-0298
Distribution/storage
General, 81-0773
Fish, 81-0750
Enzyme activity
General, 81-0230
Carboxylase, 81-0525
Mixed function oxidases, 81-0772
Excretion
Fish, 81-0158
Experimental design
Monitoring and residues, 81-0750
Factors influencing metabolism/toxicity

Lindane (cont'd)
Disease state, 81-0198
Interactions, 81-0230
Liver
Animals/experimental, 81-0230
Marrow
Human, 81-0464
Metabolism
Insects, 81-0754
Mammals, 81-0754
Mouse, 81-0230
Rat, 81-0230
Monitoring devices/programs
Ecosystems, 81-0070
Porphyrins/pigments
Animals/experimental, 81-0525
Residues/food and feed
Vegetables, 81-0071
Residues/humans
Adipose, 81-0702
Residues/non-target organisms
Molluscs, 81-0415
Residues/plants
General, 81-0121
Tobacco, 81-0381
Residues/soil
General, 81-0121
Adsorption, 81-0646, 81-0692
Movement, 81-0646
Soil types, 81-0646
Reviews
Toxicology and pharmacology
81-0754, 81-0772, 81-0773
Toxicity/experimental organisms
Annelids, 81-0763
Mouse, 81-0230
Rat, 81-0180, 81-0230
Toxicity/humans
Accidental, 81-0464

Linuron
see also Substituted ureas
Residue degradation
Soil, 81-0102, 81-0103
Residues/food and feed
Vegetables, 81-0103
Residues/soil
General, 81-0102
Persistence, 81-0103

Lorsban
see Chlorpyrifos

Malathion
see also Organophosphates
Amino acids/peptides/proteins
Plants, 81-0336
Beneficial effects, 81-0039
Bioassay, 81-0157
Biotransformation
General, 81-0773
Chromatography
Gas-liquid, 81-0295
Distribution/storage
General, 81-0773
Enzyme activity
General, 81-0232
Alkaline phosphatase, 81-0247
ATPase, 81-0247

Malathion (cont'd)
Cholinesterase, 81-0232, 81-0433
81-0781
Esterases, 81-0232
Lactic dehydrogenase, 81-0247
Factors influencing metabolism/
toxicity
Disease state, 81-0026
Formulation, 81-0026
Interactions, 81-0026
Growth
Animals/experimental, 81-0498
Lipids/steroids/sterols
Animals/experimental, 81-0507
In vitro, 81-0232
Metabolism
In vitro, 81-0232
Rat, 81-0247
Nucleic acids
Plants, 81-0336
Reproduction cycle
Animals/experimental, 81-0507
Residue degradation
Water, 81-0433
Residue removal
Food and feed, 81-0426
Residues/food and feed
Cereals, 81-0426
Residues/humans
Blood, 81-0691
Organs, 81-0691
Urine, 81-0691
Residues/non-target organisms
Fish, 81-0433
Residues/plants
Crops, 81-0426
Residues/soil
Adsorption, 81-0646
Movement, 81-0646
Soil types, 81-0646
Reviews
Toxicology and pharmacology
81-0773, 81-0781
Toxicity/experimental organisms
Annelids, 81-0157
Fish, 81-0850
Microorganisms, 81-0498
Rat, 81-0247
Toxicity/humans
General, 81-0691

Maleic anhydride
Biochemical effects
Plants, 81-0305
Phytotoxicity
Tobacco, 81-0305

Maleic hydrazide
see also Nitrogen heterocyclic herbicides
Biotransformation
Plankton/algae, 81-0112
Carcinogenesis
General, 81-0777
Mutagenesis
General, 81-0778
Residue removal
Plants, 81-0681

Maleic hydrazide (cont'd)
Residues/food and feed
Vegetables, 81-0098
Residues/plants
Crops, 81-0681
Tobacco, 81-0379
Reviews
Toxicology and pharmacology
81-0777, 81-0778
Translocation
Trees/shrubs, 81-0112

Maloran
see Chlorbromuron

Mancozeb
see also Dithiocarbamates
Cytological effects
Plants, 81-0189, 81-0190
Mitosis/meiosis
Plants, 81-0189, 81-0190
Phytotoxicity, 81-0189, 81-0190

Maneb
see also Dithiocarbamates
Prevention
Decontamination, 81-0737
Residue removal
Water, 81-0737
Residues/air
Agricultural, 81-0664
Toxicity/experimental organisms
Annelids, 81-0763

MBC
see Carbendazim

MCPA
see also Phenoxy acids
Analysis
Sample preparation, 81-0266
Carcinogenesis
Human, 81-0348
Chromatography
Column, 81-0266
HPL, 81-0861
Thin-layer, 81-0861
Experimental design
Analysis, 81-0861
Phytotoxicity
Crops, 81-0321
Prevention
Decontamination, 81-0459
Residue degradation
Soil, 81-0266
Water, 81-0459
Residues/soil
Persistence, 81-0422
Safety standards
TLV/MAC, 81-0222
Toxicity/experimental organisms
Mouse, 81-0182
Rat, 81-0182, 81-0222
Toxicity/humans
General, 81-0182

Mecarbam
Enzyme activity
Cholinesterase, 81-0144
Morbidity and mortality statistics

Mecarbam (cont'd)
Japan, 81-0144

Mefluidide
Absorption
Cow, 81-0210
Sheep, 81-0210
Distribution/storage
Cow, 81-0210
Sheep, 81-0210
Excretion
Cow, 81-0210
Sheep, 81-0210

MEMC
see also Organomercury fungicides
Nervous system
Animals/experimental, 81-0203
Reproduction/growth
Animals/experimental, 81-0203
Respiratory system
Animals/experimental, 81-0203
Toxicity/experimental organisms
Fish, 81-0203

Mercarbam
Enzyme activity
General, 81-0232
Cholinesterase, 81-0232
Metabolism
In vitro, 81-0232

Mercuric chloride
Enzyme activity
General, 81-0179
Factors influencing metabolism/toxicity
Interactions, 81-0254
Liver
General, 81-0179
Nervous system
Animals/experimental, 81-0203
Plasma/serum
General, 81-0179
Reproduction/growth
Animals/experimental, 81-0203
Respiratory system
Animals/experimental, 81-0203
Toxicity/experimental organisms
Fish, 81-0203
Rat, 81-0254

Merphos
see also Aliphatic and arylaliphatic acids
Experimental design
Analysis, 81-0862
Morbidity and mortality statistics
USA-Tennessee, 81-0736
Prevention
Protective equipment, 81-0736
Residues/air
Agricultural, 81-0862
Toxicity/humans
Accidental, 81-0736

Metalaxyl
see also Aliphatic and alicyclic nitrogen compounds
Chromatography

Metalaxyl (cont'd)
Gas-liquid, 81-0884
Thin-layer, 81-0885

Metaphos
see Methyl parathion

Metasystox
see Oxydemeton methyl

Metasystox R
see Oxydemeton methyl

Metazine
Residues/food and feed
Vegetables, 81-0135
Residues/soil
General, 81-0135
Safety standards
TLV/MAC, 81-0135
Toxicity/experimental organisms
Mouse, 81-0135
Rat, 81-0135

Methabenzthiazuron
see also Substituted ureas
Toxicity/experimental organisms
Annelids, 81-0763

Methamidophos
see also Organophosphates
Morbidity and mortality statistics
Egypt, 81-0706
Toxicity/humans
General, 81-0706
Toxicity/non-target organisms
General, 81-0706

Methazole
see also Nitrogen heterocyclic herbicides
Analysis
Sample preparation, 81-0291
Chromatography
HPL, 81-0291

Methidathion
see also Organophosphates
Analysis
Sample preparation, 81-0864
Biotransformation
Plankton/algae, 81-0095
Chromatography
Gas-liquid, 81-0284
Experimental design
Analysis, 81-0864
Residues/plants
Crops, 81-0095

Methiocarb
see also Carbamates
Chromatography
Gas-liquid, 81-0879
Monitoring devices/programs
Water, 81-0684
Residues/air
Industrial, 81-0651
Toxicity/experimental organisms
Annelids, 81-0763

Methomyl
see also Carbamates
Blood cells
Animals/experimental, 81-0800
Chromatography
Gas-liquid, 81-0879
Morbidity and mortality statistics
Egypt, 81-0706
Residue removal
Plants, 81-0681
Residues/plants
Crops, 81-0681
Toxicity/experimental organisms
Rabbit, 81-0800
Toxicity/humans
General, 81-0706
Toxicity/non-target organisms
General, 81-0706

Methoprene
see also Insect hormones and analogs
Alternative controls, 81-0324
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0359
Liver
In vitro, 81-0195
Metabolism
In vitro, 81-0195

Methoprotryne
see also Triazine herbicides
Residues/soil
Adsorption, 81-0680

Methoxychlor
see also Organochlorines
Bioassay, 81-0157
Biochemical effects
General, 81-0224
Biotransformation
General, 81-0773
Chromatography
Gas-liquid, 81-0283
Distribution/storage
General, 81-0773
Metabolism
In vitro, 81-0224
Rat, 81-0224
Models
Environmental, 81-0063
Residues/plants
Herbs, medicinals/condiments 81-0057, 81-0058
Reviews
Toxicology and pharmacology 81-0773
Spectrometry
Mass spectrometry, 81-0283
Toxicity/experimental organisms
Annelids, 81-0157
In vitro, 81-0224
Rat, 81-0224

Methoxyphenone
see also Substituted aromatic herbicides
Analysis

Methoxyphenone (cont'd)
Sample preparation, 81-0892
Chromatography
HPL, 81-0892

Methyl benzimidazole-2-yl carbamate
see Carbendazim

Methyl bromide
see also Fumigant insecticides
Prevention
General, 81-0713
Residues/air
Industrial, 81-0688
Reviews
General, 81-0823
Toxicity/experimental organisms
Rat, 81-0838

Methyl eugenol
see Insect hormones and analogs
Biotransformation
In vitro, 81-0852
Rat, 81-0852

Methyl parathion
see also Organophosphates
Analysis
General, 81-0282
Chromatography
Gas-liquid, 81-0281, 81-0295
81-0889
Enzyme activity
Cholinesterase, 81-0468, 81-0486
Experimental design
Analysis, 81-0889
Models
Environmental, 81-0063, 81-0486
Morbidity and mortality statistics
USSR, 81-0136
Mutagenesis
Animals/experimental, 81-0199
Residue removal
Food and feed, 81-0426
Residues/food and feed
Cereals, 81-0426
Residues/non-target organisms
Molluscs, 81-0417
Residues/plants
Crops, 81-0426, 81-0429
Residues/soil
Persistence, 81-0429
Spectrometry
Mass spectrometry, 81-0869
Toxicity/experimental organisms
Chicken, 81-0468
Quail, 81-0486

Methyl pentafluorophenyl sulfone
Absorption
Annelids, 81-0236

Methylene chloride
see also Fumigant insecticides
Chromatography
Gas-liquid, 81-0293

Methylmercuric chloride
see also Organomercury fungicides
Cell membranes
Animals/experimental, 81-0244
Embryo/fetus
Animals/experimental, 81-0244
Mitosis/meiosis
Animals/experimental, 81-0244
Toxicity/experimental organisms
Mouse, 81-0244

Metolachlor
see also Substituted amines
Amino acids/peptides/proteins
In vitro, 81-0033

Meturin
see also Herbicides
Titration, 81-0900

Mevinphos
see also Organophosphates
Biochemical effects
Human, 81-0803
Enzyme activity
Cholinesterase, 81-0774
Morbidity and mortality statistics
Hungary, 81-0710
Musculoskeletal system
Human, 81-0803
Nervous system
Human, 81-0803
Residue dynamics, 81-0115
Residues/food and feed
Vegetables, 81-0115
Reviews
Toxicology and pharmacology
81-0774
Toxicity/experimental organisms
Rabbit, 81-0774
Toxicity/humans
Accidental, 81-0803

Microbials
see also Bacillus sphaericus; Bacillus thuringiensis; Insecticides; *Nosema Locustae*
Alternative controls, 81-0013
Experimental design
Analysis, 81-0687
Monitoring and residues, 81-0687
Factors influencing metabolism/toxicity
Interactions, 81-0501
Toxicity/experimental organisms
Insects, 81-0501

Mipafox
see also Organophosphates
Polyneuritis
Animals/experimental, 81-0775
Human, 81-0775
Reviews
Toxicology and pharmacology
81-0775

Mirex
see also Organochlorines
Analysis
Sample preparation, 81-0864

Mirex (cont'd)
Biogenic amines
Animals/experimental, 81-0530
In vitro, 81-0530
Carcinogenesis
General, 81-0777
Chromatography
Gas-liquid, 81-0279, 81-0287
81-0561
Distribution/storage
Crustacea, 81-0480
Rat, 81-0503
Enzyme activity
ATPase, 81-0530
Mixed function oxidases, 81-0772
Experimental design
Analysis, 81-0864
Factors influencing metabolism/toxicity
Interactions, 81-0503
Liver
Animals/experimental, 81-0216
81-0502, 81-0503
Metabolism
Rat, 81-0216
Nervous system
Animals/experimental, 81-0480
Nucleic acids
Animals/experimental, 81-0502
Reviews
Toxicology and pharmacology
81-0772, 81-0777
Spectrometry
Mass spectrometry, 81-0561
Toxicity/experimental organisms
Rat, 81-0216

MMC
see Methylmercuric chloride

Molinate
see also Nitrogen heterocyclic herbicides
Biotransformation
General, 81-0773
Microorganisms, 81-0083
Distribution/storage
General, 81-0773
Mutagenesis
Animals/experimental, 81-0199
Residue degradation
Soil, 81-0083, 81-0407
Residues/soil
Volatilization, 81-0407
Reviews
Toxicology and pharmacology
81-0773

Molluscicides
see Clonitralide; PCP; Tin trimethylchloride

Monocrotophos
see also Organophosphates
Carcinogenesis
General, 81-0776
Enzyme activity
Cholinesterase, 81-0774
Mutagenesis

Monocrotophos (cont'd)
General, 81-0776
Residue removal
Plants, 81-0681
Residues/plants
Crops, 81-0681
Reviews
Toxicology and pharmacology 81-0774, 81-0776
Toxicity/experimental organisms
Rabbit, 81-0774

Monuron
see also Substituted ureas
Enzyme activity
General, 81-0048
Mutagenesis
General, 81-0778
Residues/soil
Adsorption, 81-0680
Reviews
Toxicology and pharmacology 81-0778

MSMA
see also Organic arsenicals; Organomercury fungicides
Chromatography
Column, 81-0592
Factors influencing metabolism/toxicity
Biological magnification, 81-0119
Prevention
Decontamination, 81-0737
Residue dynamics, 81-0119
Residue removal
Water, 81-0737
Spectrometry
Atomic absorption/emission 81-0592
Translocation
Aquatics, 81-0119

MTMC
see also Carbamates
Blood cells
Animals/experimental, 81-0800
Toxicity/experimental organisms
Rabbit, 81-0800

Naphthalene
see also Fumigant insecticides
Chromatography
Gas-liquid, 81-0293
Reviews
General, 81-0827

Neguvon
see Dichlorvos

Nematicides
see also 1,3-D; DBCP; Insecticides
Reviews
General, 81-0820

Nematodes
Alternative controls, 81-0317

Nicotine
see also Botanicals
Morbidity and mortality statistics

Nicotine (cont'd)
Hungary, 81-0710

Nitrapyrin
see also Nitrogen heterocyclic herbicides
Residues/food and feed
Vegetables, 81-0101

Nitroanilines
see also Herbicides; Oryzalin; Profluralin; Trifluralin
Cytological effects
Plants, 81-0044
Growth
Plants, 81-0044
Models
Mathematical, 81-0069
Monitoring devices/programs 81-0887
Residue degradation
General, 81-0887
Residue dynamics, 81-0069
Residues/food and feed
Total diet, 81-0100
Residues/soil
General, 81-0074
Residues/water
Runoff/irrigation ditches, 81-0074

Nitrobenzene
Chromatography
Gas-liquid, 81-0293

Nitrofen
see also Substituted aromatic herbicides
Carcinogenesis
Animals/experimental, 81-0215 81-0779
Distribution/storage
Plants, 81-0658
Growth
Plants, 81-0558
Liver
Animals/experimental, 81-0215
Lung
Animals/experimental, 81-0215
Phytotoxicity
Aquatics, 81-0558
Residues/food and feed
Cereals, 81-0658
Reviews
Toxicology and pharmacology 81-0779
Toxicity/experimental organisms
Annelids, 81-0763
Mouse, 81-0215
Plants, 81-0558

Nitrogen heterocyclic herbicides
see also Amitrole; Buthidazole; Chloridazon; Fluridone; Herbicides; Maleic hydrazide; Methazole; Molinate; Nitrapyrin; Picloram
Residue degradation
Soil, 81-0674

***p*-Nitrophenol**
Biotransformation
Microorganisms, 81-0061
Residue degradation
Soil, 81-0061
Water, 81-0061

Nonachlor
see also Organochlorines
Factors influencing metabolism/toxicity
Biological magnification, 81-0649
Residues/humans
Milk, 81-0386
Residues/non-target organisms
Reptiles, 81-0649

Nosema Locustae
see also Microbials
Alternative controls, 81-0026
Factors influencing metabolism/toxicity
Formulation, 81-0026
Interactions, 81-0026

Ordram
see Molinate

Organic arsenicals
see also Cacodylic acid; Herbicides; MSMA
Analysis
General, 81-0202
Carcinogenesis
Human, 81-0202
Morbidity and mortality statistics
Germany (BRD), 81-0149
Residues/soil
Adsorption, 81-0105
Persistence, 81-0105
Skin
Human, 81-0149, 81-0192
Toxicity/humans
General, 81-0202
Occupational, 81-0149, 81-0192 81-0202

Organochlorines
see also Aldrin; BHC; BHC isomers; Chlordane; Chlordecone; Chlorobenzilate; DDE; DDT; DDT derived compounds; DDT isomers; Dicofol; Dieldrin; Endosulfan; Endrin; Heptachlor; Heptachlor epoxide; Insecticides; Lindane; Methoxychlor; Mirex; Nonachlor; Oxychlordane; TDE; Tetradifon; Toxaphene
Absorption
Fish, 81-0801
Insects, 81-0801
Molluscs, 81-0801
Analysis
Sample preparation, 81-0256 81-0260, 81-0277, 81-0587 81-0899
Behavior
Animals/experimental, 81-0493
Bibliographies, 81-0639

Organochlorines (cont'd)
Biotransformation
General, 81-0773
Carcinogenesis
Animals/experimental, 81-0544 81-0779
Chromatography
Column, 81-0260
Gas-liquid, 81-0295, 81-0877 81-0878, 81-0887, 81-0899
Thin-layer, 81-0865
Distribution/storage
General, 81-0773
Human, 81-0865
Eggshell effects
Animals/experimental, 81-0493
Environmental pollution, 81-0022 81-0307, 81-0323, 81-0363 81-0640
Enzyme activity
Peroxidase, 81-0555
Enzyme assay
General, 81-0237
Experimental design
Analysis, 81-0685, 81-0877
Factors influencing metabolism/ toxicity
General, 81-0544
Interactions, 81-0237, 81-0783
Laws and regulations
France, 81-0460
Germany (BRD), 81-0460
Switzerland, 81-0460
Liver
Human, 81-0835
Models
Mathematical, 81-0069
Monitoring devices/programs 81-0887
Air, 81-0685
Morbidity and mortality statistics
Hungary, 81-0710
USA-Illinois, 81-0147
Nervous system
In vitro, 81-0551
Reproduction cycle
Animals/experimental, 81-0493
Residue degradation
General, 81-0887
Residue dynamics, 81-0069, 81-0640
Residues/food and feed
Total diet, 81-0100
Dairy products, 81-0374
Vegetables, 81-0117
Residues/humans
Adipose, 81-0668
Milk, 81-0668
Organs, 81-0668
Residues/non-target organisms
General, 81-0323
Birds, 81-0419
Molluscs, 81-0415
Residues/plants
Tobacco, 81-0379, 81-0381
Residues/soil
Sediment, 81-0411
Residues/water
Groundwater/rain, 81-0420 81-0427
Sediment, 81-0411
Reviews
General, 81-0815
Toxicology and pharmacology 81-0773, 81-0779, 81-0835
Safety standards
Water standards, 81-0460
Spectrometry
Mass spectrometry, 81-0899
Toxicity/experimental organisms
General, 81-0640
Fish, 81-0555
Toxicity/humans
General, 81-0865
Occupational, 81-0147, 81-0851
Toxicity/non-target organisms
General, 81-0543

Organomercury fungicides
see also Fungicides; MEMC; Methylmercuric chloride; MSMA; PMA
Absorption
Mouse, 81-0752
Distribution/storage
Mouse, 81-0752
Environmental pollution, 81-0633
Excretion
Mouse, 81-0752
Factors influencing metabolism/ toxicity
Biological magnification, 81-0633
Morbidity and mortality statistics
Germany (DDR), 81-0719
Residues/soil
Sediment, 81-0633
Residues/water
General, 81-0633
Toxicity/experimental organisms
Mammals, 81-0304

Organophosphate fungicides
see Edifenphos; Fungicides; IBP; Pyrazophos

Organophosphates
see also Acephate; Azinphosmethyl; Bromophos; Bromophos-ethyl; Chlorfenvinphos; Chlorpyrifos; Cyanofenphos; DEF; Demephion; Demeton;Demeton-*S*-methyl; Demeton-O-methyl; DFP; Dialifor; Diazinon; Dichlorvos; Dicrotophos; Dimethoate; Disulfoton; EPN; Ethoprop; Fenamiphos; Fenitrothion; Fensulfothion; Fenthion; Insecticides; Leptophos; Malathion; Methamidophos; Methidathion; Methyl parathion; Mevinphos; Mipafox; Monocrotophos; Oxydemeton methyl Paraoxon; Parathion; Phorate; Phosalone; Phosmet; Phosphamidon; Phoxim; Pirimiphos-methyl; Pirimiphos-methyloxon
see also Sarin; Soman; Temephos; Terbuphos; Tetrachlorvinphos; Trichlorfon
Absorption
Fish, 81-0801
Insects, 81-0801
Molluscs, 81-0801
Analysis
Sample preparation, 81-0296 81-0587
Carcinogenesis
General, 81-0740
Animals/experimental, 81-0779
Chromatography
Gas-liquid, 81-0268, 81-0295 81-0296, 81-0895
Thin-layer, 81-0865
Distribution/storage
Human, 81-0865
Enzyme activity
General, 81-0809
Cholinesterase, 81-0458, 81-0683 81-0728
Peroxidase, 81-0555
Enzyme assay
General, 81-0237
Cholinesterase, 81-0887
Experimental design
Analysis, 81-0685
Epidemiology, prevention, and treatment, 81-0786
Monitoring and residues, 81-0643 81-0728, 81-0729, 81-0895
Toxicology and pharmacology 81-0786
Factors influencing metabolism/ toxicity
Adaptation/resistance, 81-0488 81-0529, 81-0843
Interactions, 81-0218, 81-0237
Route, 81-0785
Hormones
General, 81-0740
Kidney
Human, 81-0134
Laws and regulations
France, 81-0460
Germany (BRD), 81-0460
Switzerland, 81-0460
USA, 81-0130
Metabolism
General, 81-0740
Microorganisms, 81-0652
Models
Mathematical, 81-0069
Monitoring devices/programs 81-0887
Air, 81-0685
Morbidity and mortality statistics
Germany (DDR), 81-0719
Hungary, 81-0710
Italy, 81-0134
Kenya, 81-0696
World Health Organization 81-0728

Organophosphates (cont'd)
Mutagenesis
General, 81-0777
Nervous system
Human, 81-0228
Polyneuritis
Animals/experimental, 81-0809
Human, 81-0809
Prevention
Decontamination, 81-0303
Residue degradation
General, 81-0391, 81-0887
Soil, 81-0388, 81-0674
Water, 81-0388
Residue dynamics, 81-0069
Residues/food and feed
Total diet, 81-0100
Residues/humans
General, 81-0683
Residues/non-target organisms
Duck, 81-0647
Residues/plants
Crops, 81-0431, 81-0446
Tobacco, 81-0379, 81-0431
Residues/soil
Persistence, 81-0431
Reviews
Toxicology and pharmacology 81-0762, 81-0777, 81-0779
Safety standards
General, 81-0728
Reentry time, 81-0446, 81-0729
Toxicity rating class, 81-0785
Water standards, 81-0460
Toxicity/experimental organisms
Fish, 81-0555
Guinea pig, 81-0786
In vitro, 81-0786
Insects, 81-0352
Rabbit, 81-0786
Rat, 81-0352, 81-0785, 81-0786
Toxicity/humans
General, 81-0228, 81-0696 81-0865
Accidental, 81-0303
Occupational, 81-0134, 81-0683 81-0728, 81-0851
Toxicity/non-target organisms
Microorganisms, 81-0652
Treatment of poisoning
General, 81-0458

Organotin fungicides
see also Fungicides; Tributyltin
Chromatography
Gas-liquid, 81-0870
Spectrometry
Mass spectrometry, 81-0870
Toxicity/experimental organisms
Mammals, 81-0304

Orthene
see Acephate

Oryzalin
see also Nitroanilines
Prevention
Decontamination, 81-0737
Residue removal
Water, 81-0737

Oxadiazon
Residues/water
Drinking water, 81-0437
Lakes/ponds, 81-0437
Rivers/streams, 81-0437

Oxamyl
see also Carbamates
Absorption
Annelids, 81-0235
Excretion
Annelids, 81-0235
Metabolism
Annelids, 81-0235
Models
Computer, 81-0110
Residue degradation
Soil, 81-0109, 81-0110
Residues/soil
Movement, 81-0110

Oxathiines
see also Carboxin; Fungicides; Oxycarboxin
Residue degradation
In vitro, 81-0389

Oxycarboxin
see also Oxathiines
Biotransformation
Microorganisms, 81-0408
Residue degradation
In vitro, 81-0389, 81-0408
Residues/food and feed
Vegetables, 81-0115

Oxychlordane
see also Organochlorines
Residues/humans
Milk, 81-0386
Residues/non-target organisms
Duck, 81-0418
Eggs, 81-0418

Oxydemeton methyl
see also Organophosphates
Biotransformation
Microorganisms, 81-0091
Residue degradation
Soil, 81-0091
Residue removal
Food and feed, 81-0113
Residues/food and feed
Vegetables, 81-0113, 81-0676

Oxyfluorofen
Electron transport
Plants, 81-0366
Factors influencing metabolism/toxicity
Interactions, 81-0366
Phytotoxicity
Crops, 81-0366

Oxyquinoline sulfate
see also Aliphatic and alicyclic nitrogen compounds
Prevention
Disposal, 81-0717

Paraoxon
see also Organophosphates
Biogenic amines
Animals/experimental, 81-0756
Brain
Animals/experimental, 81-0756
EEG
Animals/experimental, 81-0756
Enzyme activity
Cholinesterase, 81-0756
Esterases, 81-0808
Factors influencing metabolism/toxicity
Taxon, 81-0808
Nervous system
In vitro, 81-0551
Residue degradation
Soil, 81-0097
Residues/soil
Soil types, 81-0097
Volatilization, 81-0097
Spinal cord
Animals/experimental, 81-0552
In vitro, 81-0552
Toxicity/experimental organisms
Birds, 81-0808
Mammals, 81-0808

Paraquat
see also Bipyridyliums
Absorption
In vitro, 81-0742
Amino acids/peptides/proteins
In vitro, 81-0495, 81-0853
Biochemical effects
Animals/experimental, 81-0475
Human, 81-0795
In vitro, 81-0768
Biotransformation
Rat, 81-0187
Cell membranes
Plants, 81-0334
Chromatography
Gas-liquid, 81-0590
Digestive glands
Human, 81-0744
Distribution/storage
Mouse, 81-0550
Rat, 81-0511
Enzyme activity
Cholinesterase, 81-0475
Excretion
Human, 81-0793, 81-0795
Eyes
Human, 81-0797
Factors influencing metabolism/toxicity
Interactions, 81-0233, 81-0515
Light/radiation, 81-0768
Growth
Microorganisms, 81-0743
Hormones
Animals/experimental, 81-0475
Kidney
Animals/experimental, 81-0515

Paraquat (cont'd)
Human, 81-0793, 81-0794
Lipids/steroids/sterols
In vitro, 81-0495
Liver
Animals/experimental, 81-0515
Human, 81-0744, 81-0794
Lung
Animals/experimental, 81-0187 81-0511, 81-0515, 81-0550
Human, 81-0793, 81-0794
In vitro, 81-0467, 81-0742
Metabolism
Rat, 81-0511
Mitochondria
In vitro, 81-0472
Models
Environmental, 81-0063
Morbidity and mortality statistics
Japan, 81-0146
Mucous membranes
Human, 81-0795
Mutagenesis
Animals/experimental, 81-0482
Nervous system
Human, 81-0228
Phytotoxicity
Trees/shrubs, 81-0632
Porphyrins/pigments
In vitro, 81-0853
Residues/soil
General, 81-0074
Adsorption, 81-0660
Residues/water
Runoff/irrigation ditches, 81-0074
Respiration, cellular
In vitro, 81-0472
Teratogenesis
Animals/experimental, 81-0482
Toxicity/experimental organisms
Dog, 81-0233
Toxicity/humans
General, 81-0146, 81-0228 81-0793
Accidental, 81-0795, 81-0797
Intentional, 81-0038, 81-0794

Parathion
see also Organophosphates
Absorption
Annelids, 81-0236
Analysis
General, 81-0282
Beneficial effects, 81-0039
Biotransformation
General, 81-0773
Microorganisms, 81-0061
Chromatography
Gas-liquid, 81-0281, 81-0297
Liquid, 81-0857
Distribution/storage
General, 81-0773
Enzyme activity
General, 81-0232, 81-0499 81-0760
Cholinesterase, 81-0232
Esterases, 81-0232
Experimental design
Analysis, 81-0862
Factors influencing metabolism/ toxicity
Adaptation/resistance, 81-0499
Interactions, 81-0499
Structure/function, 81-0760
Immunology
Animals/experimental, 81-0846
Laws and regulations
France, 81-0460
Germany (BRD), 81-0460
Japan, 81-0735
Switzerland, 81-0460
Lipids/steroids/sterols
In vitro, 81-0232
Liver
In vitro, 81-0223
Metabolism
General, 81-0760
In vitro, 81-0223, 81-0232
Nervous system
Human, 81-0228
Polyneuritis
Animals/experimental, 81-0775
Human, 81-0775
Porphyrins/pigments
In vitro, 81-0223
Prevention
Decontamination, 81-0456
Residue degradation
General, 81-0456
Soil, 81-0061, 81-0097
Water, 81-0061
Residue dynamics, 81-0115
Residues/air
Agricultural, 81-0862
Residues/food and feed
Vegetables, 81-0115
Residues/humans
Blood, 81-0691
Organs, 81-0691
Urine, 81-0691
Residues/plants
Crops, 81-0429
Residues/soil
Adsorption, 81-0646
Movement, 81-0646
Persistence, 81-0429
Soil types, 81-0097, 81-0646
Volatilization, 81-0097
Reviews
Toxicology and pharmacology 81-0773, 81-0775
Safety standards
TLV/MAC, 81-0735
Water standards, 81-0183 81-0460
Spectrometry
Mass spectrometry, 81-0297
Toxicity/experimental organisms
Annelids, 81-0763
Plankton/algae, 81-0183
Toxicity/humans
General, 81-0228, 81-0691
Accidental, 81-0228

PCNB
see Quintozene

PCP
see also Molluscicides; Substituted aromatic fungicides; Substituted aromatic herbicides
Absorption
Human, 81-0733
Analysis
Sample preparation, 81-0864 81-0873
Bioassay, 81-0154
Biochemical effects
Animals/experimental, 81-0847
Human, 81-0693
Plants, 81-0527
Cell membranes
Plants, 81-0527
Chromatography
Gas-liquid, 81-0571
HPL, 81-0873
Thin-layer, 81-0299
Electrometry
Polarography, 81-0571
Environmental pollution, 81-0307
Enzyme activity
General, 81-0527
Experimental design
Analysis, 81-0864
Monitoring and residues, 81-0154
Factors influencing metabolism/ toxicity
Formulation, 81-0526
Interactions, 81-0520, 81-0524
Growth
Animals/experimental, 81-0847
Integument
Human, 81-0693
Liver
Animals/experimental, 81-0847
Models
Environmental, 81-0063, 81-0064
Porphyrins/pigments
Animals/experimental, 81-0520 81-0526
In vitro, 81-0524
Prevention
Decontamination, 81-0129
Protective equipment, 81-0733
Reproduction/growth
Animals/experimental, 81-0505
Residue degradation
Ecosystems, 81-0064
Soil, 81-0434
Residue dynamics, 81-0064, 81-0073
Residues/non-target organisms
Cow, 81-0571
Fish, 81-0073
Microorganisms, 81-0073
Molluscs, 81-0387
Residues/soil
Sediment, 81-0073
Reviews
General, 81-0829
Spectrometry
Colorimetry, 81-0571
Toxicity/experimental organisms

PCP (cont'd)
General, 81-0154
Crustacea, 81-0485
Plankton/algae, 81-0154
Polychaetes, 81-0505
Rat, 81-0847
Toxicity/humans
Occupational, 81-0693

Pentachloronitrobenzene
see Quintozene

Pentachlorophenol
see PCP

Permethrin
see also Pyrethrins
Beneficial effects, 81-0039
Biotransformation
Plants, 81-0108
Chromatography
HPL, 81-0274
Distribution/storage
Goat, 81-0209
Excretion
Goat, 81-0209
Metabolism
Goat, 81-0209
Plants, 81-0108
Residues/plants
Crops, 81-0446
Residues/soil
Movement, 81-0108
Safety standards
Reentry time, 81-0446
Toxicity/experimental organisms
Fish, 81-0782
Translocation
Crops, 81-0108

Phenmedipham
Chromatography
Gas-liquid, 81-0599

Phenothiazine
Chromatography
HPL, 81-0280
Metabolism
Hamster, 81-0492
Mouse, 81-0492
Rat, 81-0492

Phenothrin
see also Pyrethrins
Residue removal
Food and feed, 81-0671

Phenoxy acids
see also Bifenox; 2,4-D; Diclofop-methyl; Herbicides; MCPA; 2,-4,5-T
Amino acids/peptides/proteins
Plants, 81-0017
Analysis
Sample preparation, 81-0864
Biochemical effects
Plants, 81-0019
Biotransformation
General, 81-0773
Carcinogenesis
Human, 81-0450

Phenoxy acids (cont'd)
Chromatography
Gas-liquid, 81-0288
HPL, 81-0288
Thin-layer, 81-0288
Distribution/storage
General, 81-0773
Experimental design
Analysis, 81-0864
Factors influencing metabolism/toxicity
Taxon, 81-0347
Monitoring devices/programs
81-0887
Phytotoxicity
Crops, 81-0017, 81-0019
Residue degradation
General, 81-0887
Reviews
Toxicology and pharmacology
81-0773
Teratogenesis
Animals/experimental, 81-0199
Toxicity/experimental organisms
General, 81-0241
Toxicity/humans
Occupational, 81-0450

Phenylmercuric acetate
see PMA

Phorate
see also Organophosphates
Absorption
Annelids, 81-0236
Prevention
Disposal, 81-0717
Residues/food and feed
Vegetables, 81-0424, 81-0676
Residues/plants
Crops, 81-0400, 81-0424
Residues/soil
Persistence, 81-0400
Soil types, 81-0400

Phosalone
see also Organophosphates
Chromatography
Gas-liquid, 81-0295
Residue removal
Food and feed, 81-0104
Residues/plants
General, 81-0122
Residues/soil
Movement, 81-0122
Persistence, 81-0122
Residues/water
General, 81-0122

Phosdrin
see Mevinphos

Phosmet
see also Organophosphates
Monitoring devices/programs
81-0667
Mutagenesis
Animals/experimental, 81-0199
Residues/food and feed
Fruits, 81-0414

Phosphamide
see Dimethoate

Phosphamidon
see also Organophosphates
Amino acids/peptides/proteins
Animals/experimental, 81-0178
Biochemical effects
Biogenic amines, 81-0177
Blood cells
Animals/experimental, 81-0477
Enzyme activity
General, 81-0178
Mitochondria
Animals/experimental, 81-0477
Nervous system
Brain, 81-0177, 81-0178
Prevention
Disposal, 81-0717
Toxicity/experimental organisms
Rat, 81-0177, 81-0178
Ultrastructure/morphology
Animals/experimental, 81-0477

Phosphine
see also Inorganic insecticides; Rodenticides
Morbidity and mortality statistics
Germany (DDR), 81-0719
Prevention
General, 81-0713

Phosvel
see Leptophos

Photomirex
Distribution/storage
Rat, 81-0503
Factors influencing metabolism/toxicity
Interactions, 81-0503
Liver
Animals/experimental, 81-0503

Phoxim
see also Organophosphates
Mutagenesis
Animals/experimental, 81-0199

Picloram
see also Nitrogen heterocyclic herbicides
Behavior
Animals/experimental, 81-0534
Reproduction cycle
Animals/experimental, 81-0534
Residue degradation
Soil, 81-0373
Residue dynamics, 81-0373
Residues/soil
Adsorption, 81-0060
Persistence, 81-0402
Soil types, 81-0060
Residues/water
Runoff/irrigation ditches, 81-0402
Toxicity/experimental organisms
Fish, 81-0534

Piperonyl butoxide
see also Synergists
Immunology

Piperonyl butoxide (cont'd)
Animals/experimental, 81-0846

Pirimicarb
see also Carbamates
Chromatography
Gas-liquid, 81-0879

Pirimiphos-methyl
see also Organophosphates
Residue removal
Food and feed, 81-0671

Pirimiphos-methyloxon
see also Organophosphates
Enzyme activity
Esterases, 81-0808
Factors influencing metabolism/toxicity
Taxon, 81-0808
Toxicity/experimental organisms
Birds, 81-0808
Mammals, 81-0808

PMA
see also Organomercury fungicides
Amino acids/peptides/proteins
Animals/experimental, 81-0240
Enzyme activity
General, 81-0240
Liver
Animals/experimental, 81-0240
Metabolism
Rat, 81-0240
Nervous system
Animals/experimental, 81-0203
Plasma/serum
Animals/experimental, 81-0173
Reproduction/growth
Animals/experimental, 81-0203
Respiratory system
Animals/experimental, 81-0203
Toxicity/experimental organisms
Fish, 81-0203
In vitro, 81-0173
Rat, 81-0173, 81-0240

Polychlorinated biphenyls
Analysis
General, 81-0276
Sample preparation, 81-0260 81-0277, 81-0278
Biogenic amines
Animals/experimental, 81-0481
Carcinogenesis
Animals/experimental, 81-0544
Chromatography
General, 81-0278
Column, 81-0260
Gas-liquid, 81-0277, 81-0580 81-0877
Environmental pollution, 81-0124 81-0679
Experimental design
Analysis, 81-0877, 81-0898
Epidemiology, prevention, and treatment, 81-0124
Monitoring and residues, 81-0156
Toxicology and pharmacology 81-0124, 81-0156

Polychlorinated biphenyls (cont'd)
Factors influencing metabolism/toxicity
General, 81-0544
Adaptation/resistance, 81-0243
Biological magnification, 81-0156 81-0649
Laws and regulations
USA, 81-0130
Liver
Animals/experimental, 81-0502
Monitoring devices/programs 81-0007
Nucleic acids
Animals/experimental, 81-0502
Prevention
Disposal, 81-0461
Reproduction/growth
Animals/experimental, 81-0748
Residue degradation
Water, 81-0393
Residues/air
Rural, 81-0679
Residues/food and feed
General, 81-0634
Cereals, 81-0635
Fish, 81-0007, 81-0118
Meat, 81-0118
Poultry, 81-0118
Residues/non-target organisms
Birds, 81-0395, 81-0419, 81-0528
Crustacea, 81-0412
Duck, 81-0418
Eggs, 81-0395, 81-0418, 81-0528
Fish, 81-0007, 81-0416, 81-0645
Invertebrates, 81-0645
Molluscs, 81-0412
Reptiles, 81-0413, 81-0649
Residues/soil
Sediment, 81-0276, 81-0393 81-0411
Volatilization, 81-0393
Residues/water
Groundwater/rain, 81-0679
Lakes/ponds, 81-0393
Oceans/seas, 81-0412
Sediment, 81-0393, 81-0411 81-0412
Reviews
Analysis, 81-0898
Safety standards
TLV/MAC, 81-0461
Spectrometry
Mass spectrometry, 81-0580
Toxicity/experimental organisms
General, 81-0124
Microorganisms, 81-0243
Toxicity/non-target organisms
General, 81-0124
Birds, 81-0528
Eggs, 81-0528

Prefix
see Chlorthiamid

Profluralin
see also Nitroanilines
Residue degradation

Profluralin (cont'd)
Soil, 81-0406
Residues/soil
Adsorption, 81-0658

Prometone
see also Triazine herbicides
Residues/soil
Adsorption, 81-0680

Prometryne
see also Triazine herbicides
Absorption
Plankton/algae, 81-0089
Chromatography
Gas-liquid, 81-0875
Distribution/storage
Plankton/algae, 81-0089
Metabolism
Plankton/algae, 81-0089
Residue degradation
Soil, 81-0102, 81-0103
Residues/food and feed
Vegetables, 81-0103
Residues/plants
Herbs, medicinals/condiments 81-0116
Residues/soil
General, 81-0102
Persistence, 81-0103
Translocation
Crops, 81-0089

Pronamide
see also Substituted amines
Carcinogenesis
Animals/experimental, 81-0197
Chromatography
Gas-liquid, 81-0265
Liver
Animals/experimental, 81-0197
Prevention
Disposal, 81-0142
Toxicity/experimental organisms
Dog, 81-0197
Mouse, 81-0197
Rat, 81-0197

Propachlor
see also Substituted amines
Factors influencing metabolism/toxicity
Route, 81-0785
Prevention
General, 81-0712
Residue degradation
Soil, 81-0102
Residues/soil
General, 81-0102
Safety standards
TLV/MAC, 81-0712
Toxicity rating class, 81-0785
Skin
Human, 81-0712
Toxicity/experimental organisms
Rat, 81-0785
Toxicity/humans
Occupational, 81-0712

Propanil
see also Substituted amines
Reviews
Toxicology and pharmacology 81-0780
Toxicity/humans
General, 81-0780

Propham
Chromosomes/genes
In vitro, 81-0510
Factors influencing metabolism/toxicity
Temperature, 81-0510
Microtubules
In vitro, 81-0510
Mitosis/meiosis
In vitro, 81-0510

Propoxur
see also Carbamates
Beneficial effects, 81-0039
Chromatography
Gas-liquid, 81-0290, 81-0879
Factors influencing metabolism/toxicity
Biological magnification, 81-0175
Growth
Animals/experimental, 81-0498
Phytotoxicity, 81-0175
Residue degradation
Water, 81-0175
Residues/non-target organisms
Fish, 81-0175
Molluscs, 81-0175
Plankton/algae, 81-0175
Residues/soil
Sediment, 81-0175
Safety standards
Water standards, 81-0175
Toxicity/experimental organisms
Fish, 81-0175
Microorganisms, 81-0175, 81-0498
Plants, 81-0175

Pyrazophos
see also Organophosphate fungicides
Embryo/fetus
General, 81-0198
Heart
Animals/experimental, 81-0194
Residue dynamics, 81-0115
Residues/food and feed
Vegetables, 81-0115
Safety standards
Acceptable daily intake, 81-0198
Teratogenesis
General, 81-0198
Toxicity/experimental organisms
Rat, 81-0194

Pyrethrins
see also Decamethrin; Fenvalerate; Insecticides; Permethrin; Phenothrin; Resmethrin
Chromatography
Gas-liquid, 81-0572
Enzyme activity
General, 81-0234

Pyrethrins (cont'd)
Esterases, 81-0234
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0488
Immunology
Animals/experimental, 81-0846
Metabolism
Insects, 81-0234
Mammals, 81-0234
Photodecomposition, 81-0099

Pyriminil
see also Rodenticides
Blood cells
Animals/experimental, 81-0539
Carbohydrates
Human, 81-0497
Factors influencing metabolism/toxicity
Taxon, 81-0539
Pancreas (exocrine)
Human, 81-0497
Toxicity/experimental organisms
Rat, 81-0497

Quinomethionate
see also Quinones
Chromatography
Thin-layer, 81-0860
Photodecomposition, 81-0670
Residue dynamics, 81-0115
Residues/food and feed
Vegetables, 81-0115
Spectrometry
Fluorometry, 81-0860

Quinones
see also Dithianon; Fungicides; Quinomethionate
Chromatography
Gas-liquid, 81-0878

Quintozene
see also Substituted aromatic fungicides
Biotransformation
Plankton/algae, 81-0085
Carcinogenesis
Animals/experimental, 81-0779
Experimental design
Monitoring and residues, 81-0689
Toxicology and pharmacology 81-0689
Factors influencing metabolism/toxicity
Interactions, 81-0254
Immunology
Animals/experimental, 81-0846
Metabolism
Plankton/algae, 81-0086
Rat, 81-0253
Models
Environmental, 81-0689
Residues/food and feed
Total diet, 81-0665
Residues/plants
Herbs, medicinals/condiments 81-0059

Quintozene (cont'd)
Residues/soil
Adsorption, 81-0059
Persistence, 81-0059
Reviews
Toxicology and pharmacology 81-0779
Toxicity/experimental organisms
Rat, 81-0254
Translocation
Crops, 81-0085

Ramrod
see Propachlor

Repellents
see also Deet; Insecticides
Absorption
Dog, 81-0531
Excretion
Dog, 81-0531

Resmethrin
see also Pyrethrins
Chromatography
HPL, 81-0274

Rodenticides
see also ANTU; Diphacinone; Phosphine; Pyriminil; Sodium fluoroacetate; Thallium; Warfarin; Zinc phosphide
Alimentary tract
Human, 81-0491
Chromatography
Liquid, 81-0857
Lung
Human, 81-0491
Morbidity and mortality statistics
Hungary, 81-0710
Prevention
Disposal, 81-0624
Toxicity/humans
Intentional, 81-0491

Ronnel
Chromatography
Thin-layer, 81-0598

Rotenone
see also Botanicals
Biogenic amines
Animals/experimental, 81-0214
Mitochondria
In vitro, 81-0466
Muscle, smooth
Animals/experimental, 81-0214
Mutagenesis
General, 81-0778
Reviews
Toxicology and pharmacology 81-0778
Toxicity/experimental organisms
Guinea pig, 81-0214

Sarin
see also Organophosphates
Prevention
Decontamination, 81-0303

Satecid
see Propachlor

Sevin
see Carbaryl

Silvex
Residues/water
Groundwater/rain, 81-0420

Simazine
see also Triazine herbicides
Absorption
Annelids, 81-0236
Carcinogenesis
General, 81-0776
Chromatography
Gas-liquid, 81-0875
Experimental design
Monitoring and residues, 81-0689
Toxicology and pharmacology 81-0689
Models
Environmental, 81-0689
Mutagenesis
General, 81-0776
Phytotoxicity, 81-0198
Residues/plants
Herbs, medicinals/condiments 81-0116
Reviews
Toxicology and pharmacology 81-0776
Toxicity/experimental organisms
Annelids, 81-0763

Sodium fluoride
Alimentary tract
Human, 81-0491
Lung
Human, 81-0491
Toxicity/humans
Intentional, 81-0491

Sodium fluoroacetate
see also Rodenticides
Electrolytes
Animals/experimental, 81-0841
Toxicity/experimental organisms
Cat, 81-0841

Solvents
Teratogenesis
Animals/experimental, 81-0548

Soman
see also Organophosphates
Prevention
Decontamination, 81-0303

Strobane
Carcinogenesis
General, 81-0777
Reviews
Toxicology and pharmacology 81-0777

Substituted amines
see also Alachlor; Barban; Butachlor Chlormequat chloride; Chlorthiamid; 3,4-Dichloroaniline; Diethatyl-ethyl; Dinitramine;

Substituted amines (cont'd)
Diphenamid
see also Glyphosate; Herbicides; Metolachlor; Pronamide; Propachlor; Propanil
Biotransformation
Microorganisms, 81-0076
Factors influencing metabolism/toxicity
Interactions, 81-0367
Phytotoxicity
Crops, 81-0367
Prevention
Protective practices, 81-0128
Residue degradation
Soil, 81-0076
Residues/air
Industrial, 81-0128

Substituted aromatic fungicides
see also Anilate; Chlorothalonil; Dinocap; DNOC; Fenapanil; Fungicides; Hexachlorobenzene PCP; Quintozene; Trichlorophenol
Factors influencing metabolism/toxicity
Structure/function, 81-0807
Phytotoxicity
Crops, 81-0045
Reviews
General, 81-0815

Substituted aromatic herbicides
see also Chloramben; CNP; Dicamba Dinoseb; Dinoseb-acetate; DNOC; Flurecol-butyl; Herbicides; Methoxyphenone; Nitrofen; PCP
Photodecomposition, 81-0096
Reviews
General, 81-0815, 81-0817

Substituted nitriles
see Bromoxynil; Dichlobenil; Herbicides; Ioxynil

Substituted ureas
see also Chlorbromuron; Chlortoluron; Diuron; Fenuron; Fluometuron; Herbicides; Isoproturon; Isouron; Linuron; Methabenzthiazuron; Monuron
Amino acids/peptides/proteins
Plants, 81-0017
Biochemical effects
Plants, 81-0019
Carcinogenesis
General, 81-0231
Animals/experimental, 81-0199
Chromatography
Column, 81-0562
Gas-liquid, 81-0562
HPL, 81-0897
Chromosomes/genes
In vitro, 81-0231
Experimental design
Monitoring and residues, 81-0643
Models

Substituted ureas (cont'd)
Mathematical, 81-0069
Phytotoxicity
Crops, 81-0017, 81-0019
Residue degradation
Soil, 81-0388
Water, 81-0388
Residue dynamics, 81-0069
Spectrometry
Mass spectrometry, 81-0897
Toxicity/experimental organisms
In vitro, 81-0231

Sulfallate
Carcinogenesis
Animals/experimental, 81-0779
Reviews
Toxicology and pharmacology 81-0779

Sulfur dioxide
see also Inorganic fungicides; Inorganic insecticides
Residues/air
Industrial, 81-0688
Toxicity/non-target organisms
Insects, 81-0238

Sumithion
see Fenitrothion

Supracide
see Methidathion

Synergists
see also Insecticides; Piperonyl butoxide
Enzyme activity
Mixed function oxidases, 81-0772
Reviews
Toxicology and pharmacology 81-0772

2,4,5-T
see also Phenoxy acids
Adrenal
Animals/experimental, 81-0180
Biochemical effects
Biogenic amines, 81-0180
Biotransformation
General, 81-0773
Microorganisms, 81-0678
Carcinogenesis
Human, 81-0348, 81-0452
Distribution/storage
General, 81-0773
Environmental pollution, 81-0623 81-0722
Experimental design
Epidemiology, prevention, and treatment, 81-0024
Fertility/sterility
Human, 81-0695
Morbidity and mortality statistics
USA, 81-0722
USA-Michigan, 81-0695
Porphyrins/pigments
Human, 81-0239
Prevention
Decontamination, 81-0129

2,4,5-T (cont'd)
Reproduction/growth
Human, 81-0695
Residue degradation
Soil, 81-0678
Water, 81-0678
Residues/humans
General, 81-0722
Residues/non-target organisms
General, 81-0722
Reviews
Epidemiology, prevention, and treatment, 81-0722
Toxicology and pharmacology 81-0349, 81-0773
Skin
Human, 81-0239, 81-0721
Teratogenesis
Human, 81-0452, 81-0462
Toxicity/experimental organisms
Fish, 81-0848
Insects, 81-0848
Mouse, 81-0182
Rat, 81-0180, 81-0182
Toxicity/humans
General, 81-0182, 81-0695
Accidental, 81-0721

TCA
see also Aliphatic and arylaliphatic acids
Analysis
Sample preparation, 81-0267
Spectrometry
Colorimetry, 81-0267

TCDD
see Dioxins

TCPE
see also Aliphatic and arylaliphatic acids
Chromosomes/genes
Human, 81-0711
Prevention
Protective practices, 81-0711
Residues/air
Industrial, 81-0711

TDE
see also Organochlorines
Chromatography
Thin-layer, 81-0559
Experimental design
Analysis, 81-0862
Residues/air
Agricultural, 81-0862
Residues/food and feed
Fish, 81-0661
Meat, 81-0682
Residues/non-target organisms
Duck, 81-0418
Eggs, 81-0418
Fish, 81-0661
Molluscs, 81-0417
Residues/soil
Sediment, 81-0411
Residues/water
Sediment, 81-0411

Telone
see Chloropicrin; 1,3-D

Temephos
see also Organophosphates
Experimental design
Toxicology and pharmacology 81-0784
Growth
Animals/experimental, 81-0498
Reproduction/growth
Animals/experimental, 81-0784
Toxicity/experimental organisms
Fish, 81-0784
Microorganisms, 81-0498

Tepa
Amino acids/peptides/proteins
Animals/experimental, 81-0757

Terbacil
see also Uracils
Growth
Plants, 81-0558
Phytotoxicity
Aquatics, 81-0558
Trees/shrubs, 81-0425
Residues/soil
General, 81-0425
Toxicity/experimental organisms
Plants, 81-0558

Terbuphos
see also Organophosphates
Residues/plants
Crops, 81-0400
Residues/soil
Persistence, 81-0400
Soil types, 81-0400

1,2,3,5-Tetrachlorobenzene
Absorption
Annelids, 81-0236

Tetrachlorvinphos
see also Organophosphates
Enzyme activity
Esterases, 81-0217
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0217

Tetradifon
see also Organochlorines
Spectrometry
Mass spectrometry, 81-0869

Thallium
see also Rodenticides
Absorption
Human, 81-0185
Excretion
Human, 81-0185
Nervous system
Human, 81-0196
Reviews
General, 81-0832
Toxicity/humans
General, 81-0185, 81-0196

Thallium sulfate
Absorption
Human, 81-0185
Excretion
Human, 81-0185
Toxicity/humans
General, 81-0185

Thiabendazole
see also Benzimidazoles
Analysis
Sample preparation, 81-0269
Chromatography
HPL, 81-0269
Chromosomes/genes
Microorganisms, 81-0788
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0193 81-0788
Reviews
Analysis, 81-0894

Thiazoles
see also Etridiazol; Fungicides
Absorption
Plants, 81-0365
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0365
Metabolism
Plants, 81-0365
Translocation
Crops, 81-0365

Thiocarbamate herbicides
see also Benazolin; Di-allate; EPTC; Herbicides; Triallate
Carcinogenesis
Animals/experimental, 81-0199
Chromatography
HPL, 81-0897
Factors influencing metabolism/toxicity
Formulation, 81-0364
Residues/plants
Crops, 81-0364
Spectrometry
Mass spectrometry, 81-0897

Thiodan
see Endosulfan

Thiofanox
see also Carbamates
Enzyme activity
Cholinesterase, 81-0211
Excretion
Rat, 81-0208
Metabolism
Rat, 81-0208
Spectrometry
Infrared, 81-0867
Toxicity/experimental organisms
Rat, 81-0211

Thiophanate-methyl
see also Dithiocarbamates
Blood cells
Animals/experimental, 81-0800
Factors influencing metabolism/

Thiophanate-methyl (cont'd)
toxicity
Adaptation/resistance, 81-0193
Reviews
Analysis, 81-0894
Toxicity/experimental organisms
Rabbit, 81-0800

Thiram
see also Dithiocarbamates
Factors influencing metabolism/toxicity
Route, 81-0785
Mutagenesis
Animals/experimental, 81-0199
Phytotoxicity
Crops, 81-0309
Safety standards
Toxicity rating class, 81-0785
Skin
Human, 81-0132
Toxicity/experimental organisms
General, 81-0556
Rat, 81-0785
Toxicity/humans
Occupational, 81-0132

Tin trimethylchloride
see also Molluscicides
Liver
Animals/experimental, 81-0167
Toxicity/experimental organisms
Fish, 81-0167

Torak
see Dialifor

Toxaphene
see also Organochlorines
Bioassay, 81-0154
Enzyme activity
Mixed function oxidases, 81-0772
Experimental design
Analysis, 81-0862
Monitoring and residues, 81-0154
Models
Environmental, 81-0063
Residues/air
Agricultural, 81-0862
Residues/non-target organisms
Molluscs, 81-0417
Reviews
General, 81-0833
Epidemiology, prevention, and treatment, 81-0739
Toxicology and pharmacology 81-0772
Safety standards
Water standards, 81-0739
Toxicity/experimental organisms
General, 81-0154
Amphibians, 81-0508
Plankton/algae, 81-0154

Trans-2-nonenal
Alternative controls, 81-0612

Treflan
see Trifluralin

Tri-*o*-cresyl phosphate
Enzyme activity
Cholinesterase, 81-0468
Immunology
Animals/experimental, 81-0842
Polyneuritis
Animals/experimental, 81-0842
Toxicity/experimental organisms
Chicken, 81-0842

Triadimefon
Metabolism
Crops, 81-0056
Translocation
Crops, 81-0056

Triallate
see also Thiocarbamate herbicides
Factors influencing metabolism/toxicity
Interactions, 81-0370
Mutagenesis
General, 81-0778
Phytotoxicity
Crops, 81-0370
Reviews
Toxicology and pharmacology 81-0778
Toxicity/experimental organisms
General, 81-0556

Triazine herbicides
see also Atrazine; Cyanazine; Desmetryne; Herbicides; Hydroxyatrazine; Methoprotryne; Prometone; Prometryne; Simazine
Amino acids/peptides/proteins
Plants, 81-0017
Biochemical effects
Plants, 81-0019
Chromatography
Gas-liquid, 81-0895
Experimental design
Monitoring and residues, 81-0643 81-0895
Factors influencing metabolism/toxicity
Interactions, 81-0367
Models
Mathematical, 81-0069
Phytotoxicity
Crops, 81-0017, 81-0019
Residue dynamics, 81-0069

Tributyltin
see also Organotin fungicides
Endocrine system
Animals/experimental, 81-0745
Reticuloendothelial system
Animals/experimental, 81-0745

Trichlorfon
see also Organophosphates
Carcinogenesis
General, 81-0776, 81-0777
Electrolytes
In vitro, 81-0568
Enzyme activity
General, 81-0499

Trichlorfon (cont'd)
Cholinesterase, 81-0554
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0499
Interactions, 81-0499
Mutagenesis
General, 81-0776
Animals/experimental, 81-0199
Nucleic acids
Animals/experimental, 81-0554
Polyneuritis
Animals/experimental, 81-0775
Human, 81-0775
Reviews
Toxicology and pharmacology 81-0775, 81-0776, 81-0777
Skin
Human, 81-0132
Toxicity/experimental organisms
Cow, 81-0554
Toxicity/humans
Occupational, 81-0132

Trichlormetaphos-3
Chromatography
Thin-layer, 81-0598

Trichlorobenzenes
Absorption
Fish, 81-0158
Excretion
Fish, 81-0158

Trichlorophenol
see also Substituted aromatic fungicides
Residue degradation
Soil, 81-0434

Trifluralin
see also Nitroanilines
Bioassay, 81-0157
Carcinogenesis
Animals/experimental, 81-0779
Experimental design
Monitoring and residues, 81-0689
Toxicology and pharmacology 81-0689
Factors influencing metabolism/toxicity
Formulation, 81-0364
Gametogenesis
Animals/experimental, 81-0506
Models
Environmental, 81-0689
Mutagenesis
Animals/experimental, 81-0506
Residue degradation
Soil, 81-0102, 81-0406
Residues/plants
Crops, 81-0364
Residues/soil
General, 81-0102
Reviews
Toxicology and pharmacology 81-0779

TTMC
see Tin trimethylchloride

Uracils
see also Bromacil; Herbicides; Lenacil; Terbacil
Growth
Plants, 81-0558
Phytotoxicity
Aquatics, 81-0558
Toxicity/experimental organisms
Plants, 81-0558

Vel 5026
see Buthidazole

Velpar
see Hexazinone

Vernolate
Factors influencing metabolism/toxicity
Formulation, 81-0364
Residues/plants
Crops, 81-0364

Vitavax
see Carboxin

Warfarin
see also Rodenticides
Amino acids/peptides/proteins
Animals/experimental, 81-0546
Human, 81-0536
In vitro, 81-0533, 81-0536
Blood cells
Animals/experimental, 81-0545
Embryo/fetus
Human, 81-0170

Warfarin (cont'd)
Enzyme activity
General, 81-0225, 81-0540
Factors influencing metabolism/toxicity
Adaptation/resistance, 81-0219
Interactions, 81-0533, 81-0540 81-0545
Nutritional state, 81-0546
Metabolism
Rat, 81-0225, 81-0549
Placental transfer
Human, 81-0766
Porphyrins/pigments
Animals/experimental, 81-0225
Teratogenesis
Human, 81-0766

Zinc phosphide
see also Rodenticides
Blood cells
Animals/experimental, 81-0539
Enzyme activity
Alkaline phosphatase, 81-0518
Factors influencing metabolism/toxicity
Taxon, 81-0539
Growth
Animals/experimental, 81-0518
Toxicity/experimental organisms
Rat, 81-0518

Zineb
see also Dithiocarbamates
Blood cells
Animals/experimental, 81-0800
Enzyme activity

Zineb (cont'd)
General, 81-0230
Factors influencing metabolism/toxicity
Interactions, 81-0230
Liver
Animals/experimental, 81-0230
Metabolism
Mouse, 81-0230
Rat, 81-0230
Phytotoxicity
Crops, 81-0309
Residues/food and feed
Fruits, 81-0081
Residues/plants
Crops, 81-0114
Toxicity/experimental organisms
General, 81-0556
Mouse, 81-0230
Rabbit, 81-0800
Rat, 81-0230

Ziram
see also Dithiocarbamates
Mutagenesis
Animals/experimental, 81-0199

Zozanex
Skin
Human, 81-0132
Toxicity/humans
Occupational, 81-0132

Author Index

Aaronson, M. J., 81-0140
Abbadie, D., 81-0803
Abdashimov, K. A., 81-0136
Abdelghani, A. A., 81-0119
Abelentsev, V. I., 81-0037
Abelentseva, G. M., 81-0218
Abidi, S. L., 81-0881
Abrahamson, L. J., 81-0804
Acara, M., 81-0770
Adamis, Z., 81-0710
Adams, J. D., 81-0685, 81-0730
Adler, I. R., 81-0658
Agarwal, N., 81-0517
Agnihotri, V. P., 81-0082
Agosin, M., 81-0195
Ahuja, S., 81-0570
Aist, J. R., 81-0212
Akagawa, E., 81-0796
Akerman, K. E. O., 81-0466
Akers, W. A., 81-0531
Akesson, N. B., 81-0054, 81-0727
Akey, W., 81-0368
Akhtar, M. H., 81-0207
Akitomi, K., 81-0796
Akiyama, K., 81-0386
Akood, M., 81-0843
Akulov, A. V., 81-0556
Al-Najjar, N. R., 81-0189, 81-0190
Albert, L., 81-0378, 81-0634, 81-0635
Albro, P. W., 81-0263
Aldana, P., 81-0634, 81-0635
Aldridge, W. N., 81-0762
Alekperov, I. I., 81-0397
Alexander, M., 81-0678
Ali, B., 81-0463
Aliverti, V., 81-0548
Allen, E. D., 81-0170
Allen, G. E., 81-0009
Allen, J. G., 81-0423
Allen, J. R., 81-0804, 81-0805
Allen, M. J., 81-0334
Amadori, E., 81-0861
Amer, S. M., 81-0191
Anan'eva, N. D., 81-0142
Anasuya, R., 81-0188
Anbalagan, K., 81-0426
Anderson, A. C., 81-0119
Anderson, J. L., 81-0258
Anderson, J. R., 81-0315
Anderson, M. L., 81-0393
Anderson, M. S., 81-0151
Ando, M., 81-0783
Andow, D., 81-0622
Andrade, P., 81-0581
Andrews, R. E., Jr., 81-0565
Andujar, M., 81-0746
Anjo, D. M., 81-0531
Annapurna, Y., 81-0114
Antsiferov, S. D., 81-0556
Arad, I. D., 81-0467
Arai, Y., 81-0794
Argauer, R. J., 81-0282, 81-0859
Ariwa, R., 81-0744
Armstrong, D. W., 81-0469
Arvieu, J. C., 81-0375, 81-0376
Asano, Y., 81-0146, 81-0795
Ashack, R. J., 81-0214
Asman, M., 81-0314, 81-0315
Atallah, Y. H., 81-0088
Atlas, E., 81-0679
Atmawijaya, S., 81-0564
Auerbach, S. I., 81-0606
August, D., 81-0545
Awasthi, M. D., 81-0676
Awasti, M. D., 81-0113
Axelson, O., 81-0347
Azuumi, Y., 81-0560
Babkina, E. I., 81-0295
Baca, T. E., 81-0139
Bacaioni, A., 81-0256
Bai, K. M., 81-0518
Bailey, H. C., 81-0157
Baillie, M., 81-0170
Baker, M. D., 81-0434
Baker, R. J., 81-0109
Baker, T., 81-0532
Baksi, S. N., 81-0541
Balasubramanya, R. H., 81-0408
Baldi, E., 81-0134
Baldwin, B. C., 81-0808
Baldwin, F. L., 81-0012
Baltazar, R. F., 81-0491
Banerjee, R., 81-0834
Banerjee, S. K., 81-0336
Banerji, A., 81-0519
Bansal, O. P., 81-0662
Bansal, S. K., 81-0504
Barabas, K., 81-0515
Barath, M., 81-0711
Barber, D. L., 81-0546
Barfield, C. S., 81-0013
Barquet, A., 81-0631
Barron, A. L., 81-0246
Barrons, K. C., 81-0027
Barsotti, D. A., 81-0804
Barthalmus, G. T., 81-0162
Baskunov, B. P., 81-0076
Basol, M. S., 81-0781
Bastide, J., 81-0388
Bath, J. E., 81-0009
Batora, I., 81-0809
Batt, B. D. J., 81-0489
Battin, J., 81-0803
Baughman, G. L., 81-0063
Baughman, R., 81-0722
Baughman, R. W., 81-0721
Baumann, R., 81-0390
Baynes, R. K., 81-0293
Beamer, W. H., 81-0734
Beckwith, J. B., 81-0462
Belasco, I. J., 81-0092
Bellincampi, D., 81-0229
Bengston, M., 81-0671
Benke, P. J., 81-0462
Bennett, M. A., 81-0296
Bennett, R. S., Jr., 81-0787
Benveniste, I., 81-0048
Beraud, M., 81-0854
Berencsi, G., 81-0482, 81-0506 81-0515
Berndt, W. O., 81-0248
Berry, E. C., 81-0344
Bessmertnova, N. V., 81-0516
Bettarini, F., 81-0043
Beyer, W. N., 81-0399
Bhat, M. V., 81-0408
Bidlingmeyer, B. A., 81-0590
Biernat, J., 81-0019
Bingham, E., 81-0123
Bird, G. W., 81-0011
Birge, W., 81-0062
Bishop, W. E., 81-0155
Bjerk, J. E., 81-0645
Black, J. A., 81-0489
Blackman, G. L., 81-0280
Blalock, L. W., 81-0028
Blaser, A., 81-0588
Blekkenhorst, G. H., 81-0521, 81-0522
Blondell, J., 81-0730
Bluman, N., 81-0100
Boari, C., 81-0134
Boesten, J. J. T. I., 81-0110
Bogacka, T., 81-0175
Boka, G., 81-0658
Bonanomi, L., 81-0548
Bondarev, V. S., 81-0373
Boorman, G. A., 81-0613
Borkowska, J., 81-0177, 81-0475
Borowska, J., 81-0178
Borzelleca, J. F., 81-0659, 81-0771 81-0840
Boschi, P. M., 81-0351
Bostater, C. R., Jr., 81-0070
Bothen, K. D., 81-0257
Botina, T. I., 81-0103
Bouchaud, G., 81-0756
Bourquin, A. W., 81-0061
Boveris, A., 81-0467
Boyd, M. R., 81-0187
Boyer, K. W., 81-0586
Bradway, D. E., 81-0691, 81-0895
Brandt, I., 81-0153
Branson, D. R., 81-0064
Bratin, K., 81-0857
Braun, H. E., 81-0431
Brawn, R. J., 81-0846
Brawner, O. L., 81-0319
Brealey, C. J., 81-0808
Breimer, D. D., 81-0751
Bresnitz, E., 81-0201
Brevik, E. M., 81-0645
Briggs, G. G., 81-0236
Brinkman, U. A., 81-0562, 81-0589
Bromilow, R. H., 81-0109, 81-0110 81-0111
Brookes, N., 81-0552
Brooks, G. T., 81-0773
Brown, A. W. A., 81-0039
Brown, L., 81-0436
Brownell, R. L., Jr., 81-0416
Brungs, W. A., 81-0124
Buck, N. A., 81-0446

Buijs, W., 81-0751
Buikema, A. L., Jr., 81-0062
Bulger, W. H., 81-0224
Bulinski, R., 81-0384
Bulla, L. A., Jr., 81-0565
Burditt, A. K., Jr., 81-0275
Burger, R. O., 81-0585
Burns, A. J., 81-0292
Burns, D. A., 81-0856
Burns, R. G., 81-0674
Burnside, O. C., 81-0443
Burrell, R. E., 81-0484
Burse, V. W., 81-0260
Bursztein, B., 81-0841
Burt, D. R., 81-0552
Businelli, M., 81-0269
Butkas, S. A., 81-0413
Byczkowski, J. Z., 81-0478
Caccialanza, G., 81-0576
Cadenas, E., 81-0467
Cage, B., 81-0684
Cain, K. T., 81-0535
Cairns, J., Jr., 81-0003, 81-0005
81-0161
Calamari, D., 81-0430
Calderon, G. R., 81-0683
Calvet, R., 81-0375, 81-0376
Camoni, I., 81-0377
Campbell, B. S., 81-0565
Campbell, T. A., 81-0326
Camper, N. D., 81-0406
Cannizzaro, R. D., 81-0870
Carlstrom, A. A., 81-0579
Carman, G. E., 81-0732
Caro, J. H., 81-0685
Carpenter, P. K., 81-0108
Carroll, D. I., 81-0869
Carroll, J., 81-0156
Carter, G. A., 81-0807
Cashin, M. J., 81-0549
Cashman, J. R., 81-0245
Casida, J. E., 81-0234
Cassidy, J. E., 81-0095, 81-0866
Castro, J. A., 81-0249
Cattrall, P. J., 81-0770
Caudarella, R., 81-0134
Cebrian, M. E., 81-0378
Cech, J. J., Jr., 81-0313
Cescas, M. P., 81-0105
Ceschini, P., 81-0381
Cessna, A. J., 81-0271
Ceuterick, A., 81-0494
Chakrabarti, S., 81-0336
Chakravarti, R. N., 81-0517
Chamberlain, K., 81-0807
Chambers, H. W., 81-0842
Chance, B., 81-0467
Chand, B., 81-0205
Chaplin, J. F., 81-0379
Chapman, R. A., 81-0400
Charles, J. M., 81-0742
Chau, A. S. Y., 81-0276
Chauchaix, R., 81-0381
Chawla, R. P., 81-0409
Cherry, D. S., 81-0161
Cherwonogrodzky, J. W., 81-0357
Chesalin, G. A., 81-0002, 81-0301
Chesler, S. N., 81-0898
Chesney, D. J., 81-0258
Chetty, C. S. R., 81-0188
Chiba, M., 81-0582
Chin, B. H., 81-0208, 81-0211
81-0273
Chitrangad, B., 81-0432
Cho, S., 81-0462
Choragiewicz, H., 81-0177, 81-0178
81-0475
Chou, S. S., 81-0372
Chowdhury, J. S., 81-0247
Ciesla, W. M., 81-0401
Clark, D. R., Jr., 81-0416
Clark, T., 81-0670
Clarke, W. C., 81-0534
Clarren, S. K., 81-0462
Clay, V. E., 81-0093, 81-0094
Clegg, D. E., 81-0872
Clement, R. P., 81-0165
Clifford, D. R., 81-0421
Coburn, C. B., 81-0850
Coburn, J. A., 81-0561
Cochrane, W. P., 81-0864
Cogley, D. R., 81-0636
Cohen, R. C., 81-0458
Colbo, M. H., 81-0227
Cole, F. M., 81-0226
Coli, W. M., 81-0341
Colle, M., 81-0803
Colombi, A. M., 81-0337
Colvin, H. W., Jr., 81-0546
Comba, M. E., 81-0561
Connell, M., 81-0671
Conner, A. H., 81-0632
Connolly, J. P., 81-0075, 81-0439
Connors, T. A., 81-0537
Conway, W. D., 81-0770
Cook, E. E., 81-0633
Cook, R. L., 81-0259
Cooke, L. R., 81-0421
Cooper, P., 81-0513
Copplestone, J. F., 81-0707
Corke, C. T., 81-0484
Coste, C. M., 81-0388
Cotterill, E. G., 81-0261, 81-0291
Cowan, W. F., 81-0489
Cowen, W. F., 81-0293
Coyle, J. F., 81-0486
Crabbe, R., 81-0106, 81-0107
Cremlyn, R. J., 81-0614
Crist, H. L., 81-0287
Crocker, J. F. S., 81-0152
Crombach, C., 81-0183
Cueto, C., Jr., 81-0779
Cuperus, R., 81-0589
Curley, A., 81-0618
Curtin, T., 81-0766
Curtis, C. F., 81-0843
Curtis, L. R., 81-0503
Dabi, R. K., 81-0029
Dal Piccolo, C. R., 81-0016
Daiela, R. C., 81-0504
Dallimunthe, D., 81-0145
Danauskas, J. X., 81-0453, 81-0593
81-0594, 81-0631
Dandliker, W. B., 81-0846
Darnis, F., 81-0544
Das, K. K., 81-0336
Dastidar, S. G., 81-0336
David, D., 81-0538
Davidson, G., 81-0843
Davidson, L. I., 81-0565
Davie, S., 81-0106, 81-0107
Davies, D. B., 81-0747
Davies, D. S., 81-0853
Davies, H. A., 81-0648
Davies, J. E., 81-0631, 81-0733
Davies, O. L., 81-0306
Davies, R. A. H., 81-0671
Davis, J. E., 81-0677
Davis, M. E., 81-0248
Day, R. S., 81-0521, 81-0522
de Andrea, M. M., 81-0646
de Fenos, O. M., 81-0249
de Ferreyra, E. C., 81-0249
de Jong, R. A. W., 81-0751
de la Graviere, B. J., 81-0620
de la Manche, I., 81-0756
de Souza, D., 81-0052
de Vos, B. J., 81-0562
de Wit, J. M. F., 81-0338
Dean, J. H., 81-0613
Debets, F. M. H., 81-0523
Decloitre, F., 81-0230
DeCrosta, A., 81-0350
Dedeja, P. K., 81-0247
Degteva, A. I., 81-0876
Delaforge, M., 81-0852
Delle Femine, P., 81-0377
Demidenko, N. M., 81-0698
deOude, N. T., 81-0004
Derache, R., 81-0854
Desaiah, D., 81-0530
Deshpande, U. D., 81-0206
Desi, I., 81-0786
Desmarchelier, J. M., 81-0671
Desroches, A. M., 81-0756
Devasagayam, T. P. A., 81-0519
DeVries, G., 81-0589
di Domenico, A., 81-0328, 81-0329
81-0330, 81-0331, 81-0332, 81-0333
Dibtseva, A. V., 81-0295
Dickson, K. L., 81-0003, 81-0005
81-0068, 81-0161
Didenko, G. G., 81-0199
Dikshit, A. K., 81-0113
Dilley, R. A., 81-0366
Dirr, E., 81-0884
Dobbs, A. J., 81-0307
Dobinson, A., 81-0872
Dolmanova, I. F., 81-0600
Dombay, Z., 81-0712
Domir, S. C., 81-0112
Donald, T., 81-0493
Dooms-Goossens, A., 81-0494
Dooms, M., 81-0494
Dore, M., 81-0459
Dorough, H. W., 81-0657
Downing, J., 81-0028
Drury, J. S., 81-0638
Duane, W. C., 81-0208, 81-0211
Dumas, T., 81-0880
Durst, F., 81-0048

Duthie, J. R., 81-0125
Dutton, M. F., 81-0151
Dyson-Hudson, R., 81-0622
Dzeeva, V. P., 81-0641
Dzidic, I., 81-0869
Eales, L., 81-0521, 81-0522
Eapen, J., 81-0519
Eaton, J. G., 81-0006
Ecobichion, D. J., 81-0250
Edens, T. C., 81-0015
Eder, E., 81-0166
Edgerton, T. R., 81-0895
Edwards, J. A., 81-0674
Edwards, W. M., 81-0404
Effler, S. W., 81-0438
Egle, J. L., Jr., 81-0840
Egnatz, D. G., 81-0454
Ehling, U. H., 81-0749
Eiceman, G. A., 81-0877
El-Araf, A., 81-0139
El-Gamal, A., 81-0702
El-Ghawaby, S. H., 81-0706
El-Khishen, S. A., 81-0703
El-Sebae, A. H., 81-0618, 81-0619
El-Zorgani, G. A., 81-0661
Elias, L., 81-0106, 81-0107
Elkington, A. R., 81-0170
Elliot, M., 81-0806
Elliott, J. M., 81-0431
Ellis, T. L., 81-0014
Elmer, H. S., 81-0319
Engelhardt, G., 81-0091
Ennet, D., 81-0116
Enos, H. F., 81-0453, 81-0593
81-0594, 81-0631, 81-0888
Epler, J. L., 81-0607
Erdos, G., 81-0713
Eren, S., 81-0781
Esquivel, O. A., 81-0634, 81-0682
Estesen, B. J., 81-0446
Eto, M., 81-0372
Evans, G., 81-0243
Evans, R. L., 81-0686
Evans, W. A., 81-0688
Everest, J. W., 81-0690
Evodokimov, S. M., 81-0556
Ewart, W. H., 81-0319
Fabacher, D. L., 81-0772
Fabry, J., 81-0714
Fahmy, M. A. H., 81-0093
Falandysz, J., 81-0118, 81-0308
Faragalla, A. A., 81-0344
Farah, O. R., 81-0191
Farkas, I., 81-0786
Farkasdy, J., 81-0712
Farnham, A. W., 81-0806
Fasco, M. J., 81-0549
Fayolle, L., 81-0763
Federici, B. A., 81-0312, 81-0316
Feil, V. J., 81-0283
Ferreira, G. A., 81-0862
Fetter-Lasko, J., 81-0316
Feys, J. L., 81-0059
Ficarra, B. J., 81-0131
Fida, P., 81-0115
Field, S. D., 81-0438
Filacchioni, G., 81-0371
Filatova, G. A., 81-0433
Fingerman, S. W., 81-0481
Finlayson, B. J., 81-0487
Finnlund, M., 81-0395
Fischer, W. C., 81-0866
Fisher, A. B., 81-0467
Fith, W. J., 81-0737
Fletcher, R. A., 81-0368
Foil, L. D., 81-0842
Foley, M. E., 81-0364
Foster, D. O., 81-0632
Foster, R. J., 81-0630
Foster, R. N., 81-0342
Foster, T. S., 81-0207
Fournier, E., 81-0553
Fox, G. A., 81-0493
Foy, W., 81-0636
Fraczek, S., 81-0479
Francis, B. M., 81-0483
Francis, T. R., 81-0021
Francois, C., 81-0564
Frank, R., 81-0431
Frankel, B. J., 81-0497
Fraser, A. R., 81-0250
Fraser, F. C., 81-0462
Freal, J. J., 81-0453, 81-0593
81-0594
Fred, D., 81-0449
Freed, V. H., 81-0631, 81-0733
Freedman, Z. R., 81-0497
Freeman, M. A. H., 81-0109
Friedman, A. A., 81-0850
Friesen, M., 81-0847
Friesen, M. D., 81-0263
Fry, D. M., 81-0802
Fry, W. E., 81-0010
Fuchsbichler, G., 81-0596
Fujimoto, T., 81-0244
Fujiya, H., 81-0497
Fukazawa, Y., 81-0300
Fukuda, Y., 81-0744
Fukuto, T. R., 81-0093, 81-0094
Funahashi, N., 81-0745
Funari, E., 81-0377
Fung, R., 81-0625
Funk, M., 81-0491
Furtado, D., 81-0354
Furutani, F., 81-0444
Fuzesi, I. F., 81-0715
Gagne, C. C., 81-0499
Gaillard, D., 81-0854
Gall, G. A. E., 81-0313
Gallahan, D., 81-0622
Gallotti, C., 81-0081
Gameza, N. A., 81-0167
Gandini, C., 81-0576
Gannon, J. F., 81-0694
Garcia, R., 81-0312, 81-0313
Gasiewicz, T. A., 81-0362
Gasztonyi, M., 81-0056
Gaul, M., 81-0279
Gawecki, J., 81-0470
Gay, M. L., 81-0416
Gearhart, H. L., 81-0259
Gehring, P. J., 81-0758
Gehrs, C. W., 81-0606
Geissler, A. E., 81-0044
Geissler, W. G., 81-0200
Gelman, A., 81-0750
Gendle, P., 81-0421
Generoso, W. M., 81-0535
Gennari, P., 81-0134
George, D. A., 81-0285
Georghiou, G. P., 81-0359, 81-0529
Gerber, M. A., 81-0835
Gertig, H., 81-0383
Getz, M. E., 81-0863
Ghiasuddin, S. M., 81-0755
Giam, C. S., 81-0387, 81-0679
81-0873
Giardi, M. T., 81-0371
Giardina, M. C., 81-0371
Giavini, E., 81-0548
Gilbert, J., 81-0595
Giles, R. C., 81-0480
Gill, S. S., 81-0753
Ginevan, M. E., 81-0238
Girenko, D. B., 81-0268
Giri, A. K., 81-0834
Gish, C. D., 81-0399
Glazer, E. J., 81-0532
Gledhill, W. E., 81-0067
Glick, B., 81-0842
Glockling, F., 81-0304
Glover, E., 81-0610
Gluck, S. J., 81-0871
Gnusowski, B., 81-0264, 81-0265
Goes, E. A., 81-0140
Goh, K. M., 81-0425
Goldberg, A. M., 81-0551, 81-0552
Goldfrank, L., 81-0201
Goldstein, J. A., 81-0847
Golovleva, L. A., 81-0083
Goodman, F. R., 81-0214
Goodson, L. H., 81-0684
Gorbach, S., 81-0894
Goretti, G., 81-0256
Goring, C. A. I., 81-0069
Gorog, K., 81-0109
Goto, S., 81-0874, 81-0892
Gottlieb, S. F., 81-0252
Goyal, R. N., 81-0662
Gozzo, F., 81-0351, 81-0352
Grajeta, H., 81-0018
Graney, R. L., 81-0161
Grantham, B. J., 81-0417
Gray, A. J., 81-0537
Gray, C. L., 81-0867
Grayson, B. T., 81-0673
Green, D., 81-0463
Greenberg, L., 81-0238
Greenhalgh, R., 81-0629
Greim, H., 81-0764
Grice, H. C., 81-0129
Griffin, D. A., 81-0278
Griffith, T. J., 81-0158
Groba, J., 81-0175
Grobe, V. J. W., 81-0192
Grodsky, G. M., 81-0497
Gross, D., 81-0588
Grossbard, E., 81-0398
Gryder, R. M., 81-0535
Gualandi, G., 81-0229
Guerin, P. M., 81-0612

Gull, K., 81-0767
Gunkel, G., 81-0557
Gunther, F. A., 81-0274, 81-0360
81-0630, 81-0896
Gupta, A. K., 81-0504
Gupta, G. C., 81-0138
Gupta, H. C., 81-0029
Gutekunst, H., 81-0588
Guthrie, W. D., 81-0344
Gyapai, J., 81-0716
Gyuerk, I., 81-0621
Hackman, E. E., III, 81-0624
Haering, M., 81-0571
Haight, E. A., 81-0844
Hale, F., 81-0438
Hall, G., 81-0087
Hall, I. M., 81-0312
Hall, J. G., 81-0462
Hall, J. K., 81-0074
Hall, R. J., 81-0508, 81-0649
Halliop, J., 81-0477
Halpert, J. R., 81-0223
Hamaker, T. L., 81-0163
Hamboeck, H., 81-0588
Hamelink, J., 81-0065
Hamers, W. J. H. M. B., 81-0523
Hamill, A. S., 81-0021
Hammock, B. D., 81-0868
Hammons, A. S., 81-0638
Hamon, G., 81-0230
Handa, S. K., 81-0113
Handler, P., 81-0130
Hankawa, Y., 81-0078, 81-0079
81-0080
Hansen, D., 81-0065
Hansen, D. J., 81-0154
Hanumante, M. M., 81-0206
Hanzlik, R. P., 81-0245
Hara, H., 81-0145
Hardell, L., 81-0348
Hardigree, A. A., 81-0607
Harper, D. B., 81-0374
Harris, C. R., 81-0400
Harris, M. W., 81-0613
Harris, R. L. N., 81-0045
Harrison, E. A., 81-0639
Hartwig, N. L., 81-0074
Harvan, D. J., 81-0263
Harvey, J., Jr., 81-0844, 81-0855
Harvey, M. J., 81-0769
Hasan, M., 81-0496
Hasegawa, H., 81-0838, 81-0839
Haseltine, S. D., 81-0418, 81-0649
Hass, J. R., 81-0263, 81-0847
Hatakeyama, N., 81-0663, 81-0784
Hatzios, K. K., 81-0365
Hauch, R. G., 81-0485
Hauck, H. E., 81-0861
Hauschild, K. I., 81-0341
Hayashi, S., 81-0668, 81-0794
Hayashi, Y., 81-0145
Hayes, W. J., Jr., 81-0708
Haynes, D. L., 81-0014
Haynes, R. J., 81-0425
Head, S. L., 81-0260
Heidelberger, C., 81-0608
Heikes, D. L., 81-0578
Heinz, G., 81-0649
Helene, C. G., 81-0646
Hemingway, J., 81-0843
Hendricks, A. C., 81-0006
Hennigar, G. R., 81-0840
Henry, J. E., 81-0342
Henschler, D., 81-0166
Hensen, L., 81-0483
Hepler, P. R., 81-0616
Hermann, B., 81-0862
Hertz, H. S., 81-0898
Herzberg, A., 81-0750
Hickman, P., 81-0847
Hicks, A. N., 81-0846
Hildebrand, P., 81-0368
Hill, B. D., 81-0369
Hill, J. A., 81-0531
Hill, K. R., 81-0863
Hill, T. E., 81-0686
Hirai, K., 81-0144, 81-0232
Hiramatsu, R., 81-0444
Hirase, F., 81-0791
Hirata, S. Y., 81-0244
Hislop, R. G., 81-0341
Ho, A. C., 81-0280
Hodge, V., 81-0363
Hodgson, D. W., 81-0287
Hodgson, E., 81-0772
Hoegman, P. G., 81-0153
Hoerauf, R. A., 81-0034
Holgate, M. E., 81-0421
Hollingworth, R. M., 81-0164
Holnar, J., 81-0785
Holsapple, M. P., 81-0150
Holt, C. L., 81-0407
Holub, B. J., 81-0747
Homma, K., 81-0838
Honeycutt, R. C., 81-0658
Hong, S. K., 81-0770
Hood, M. A., 81-0652
Hooftman, R. N., 81-0505
Hoover, K. L., 81-0215
Hopkins, J., 81-0452
Horgan, P. M., 81-0054
Horii, S., 81-0386
Horning, E. C., 81-0869
Horwitz, W., 81-0586
Hosoda, S., 81-0795
Hotta, K., 81-0560
Howard, R. J., 81-0212
Howitt, R. E., 81-0320
Hoy, M. A., 81-0488
Hoying, S. A., 81-0343
Hrung, Y., 81-0387, 81-0873
Huang, M. T., 81-0764
Huggett, R. J., 81-0394
Hughes, D. L., 81-0748
Huizenga, L. J., 81-0460
Hunsinger, R. N., 81-0480
Hunt, L. M., 81-0209
Hunt, T. W., 81-0656
Huppatz, J. L., 81-0044, 81-0045
Hyde, W., 81-0279
Hylin, J. W., 81-0361
Iandolo, J. J., 81-0565
Ide, G., 81-0745
Ikunuma, T., 81-0795
Ilialetdinov, A. N., 81-0083
Imamura, N., 81-0663
Indira, K., 81-0188
Ippen, H., 81-0520
Ireland, J. S., 81-0220
Irish, M., 81-0622
Isa, A. L., 81-0701
Isensee, A. R., 81-0689
Ishihara, K., 81-0560
Ishikura, S., 81-0878
Ishimaru, O., 81-0143
Issaq, H. J., 81-0294
Ivanchenko, V. V., 81-0122
Ivie, G. W., 81-0209, 81-0210
Iwakuma, T., 81-0663
Iwasaki, I., 81-0745
Iwata, Y., 81-0274, 81-0630, 81-0731
Iyer, P. P., 81-0054
Izmailova, G. D., 81-0698
Jackson, C., 81-0036
Jacobson, S., 81-0622
Jagnow, G., 81-0743
Janes, N. F., 81-0806
Janssen, M. M. T., 81-0337
Jarvisalo, J. O., 81-0466
Jayaraman, J., 81-0426
Jeleniewicz, K., 81-0176
Jelinkova, N., 81-0072, 81-0182
Jensen, R. G., 81-0221
Jha, L. K., 81-0757
Jirasek, L., 81-0049
Johns, D. B., 81-0454
Johnsen, T. N., Jr., 81-0402
Johnson, C. E., 81-0065
Johnson, D. M., 81-0806
Johnson, H. E., 81-0065
Johnson, M. K., 81-0775
Johnston, P., 81-0363
Jones, K. G., 81-0226
Jones, R. D., 81-0652
Joos, J. L., 81-0488
Jorgenson, T. A., 81-0776
Josepovits, G., 81-0056, 81-0717
Joshi, A. G., 81-0203
Joyner, R. E., 81-0141
Jozsa, A., 81-0280
Junk, G. A., 81-0420
Kadous, A. A., 81-0755
Kahuho, S. K., 81-0696
Kaku, K., 81-0793
Kal'sada, I. N., 81-0692
Kallio, H., 81-0101
Kalmaz, E. V., 81-0035
Kalra, R. L., 81-0409
Kaminsky, L. S., 81-0225
Kamps, L. R., 81-0586
Kamzolova, O. I., 81-0103
Kanashima, H., 81-0666
Kaneko, S., 81-0386
Kangas, J., 81-0664
Kannan, N., 81-0426
Kanwar, K. C., 81-0752
Kapoor, K., 81-0558
Kapoor, S. K., 81-0409
Karabut, N. E., 81-0900
Karam, J. H., 81-0497
Karasek, F. W., 81-0877

Kardell, L., 81-0302
Karetskaia, N. A., 81-0102
Karr, J. J., 81-0281
Kasuga, S., 81-0663, 81-0784
Kaveeshwar, U., 81-0465
Kawai, K., 81-0839
Kawai, S., 81-0233
Kawano, Y., 81-0099
Kawate, R., 81-0145
Kazano, H., 81-0801
Keating, D. L., 81-0415
Kello, D., 81-0741
Kelly, J. D., 81-0280
Kenage, E. E., 81-0069
Kendall, R. J., 81-0486
Kessler, E., 81-0449
Keukens, H. J., 81-0277
Khan, H. M., 81-0500
Khan, M. A. Q., 81-0237
Khan, S. U., 81-0089, 81-0207
81-0660
Khyller, G. K., 81-0517
Kida, K., 81-0667
Kilgore, W. W., 81-0727
Kimber, R. W. L., 81-0675
Kimbrough, R. D., 81-0780
Kimerle, R. A., 81-0067
Kimmel, C. A., 81-0547
Kimura, T., 81-0143
Kinebuchi, H., 81-0792, 81-0798
81-0799
King, J. R., 81-0275
King, K. A., 81-0419
King, W. P., 81-0857
Kira, S., 81-0873
Kirkwood, R. C., 81-0353
Kissinger, P. T., 81-0857
Kita, I., 81-0222
Kita, K., 81-0222
Kiviat, E., 81-0413
Klein, H. H., 81-0840
Klemmer, H. W., 81-0693
Klimek, K., 81-0177, 81-0475
Klisenko, M. A., 81-0268
Klukowska-Siczek, L., 81-0174
Klysheva, A. L., 81-0083
Knaak, J. B., 81-0630, 81-0729
Knop, N. F., 81-0488
Koening, H. E., 81-0015
Kofman, I. S., 81-0875
Kohn, G. K., 81-0597
Koivusaari, J., 81-0395
Kojima, M., 81-0874
Kolesar, D., 81-0726
Kolesnikov, V. A., 81-0102
Koncz, A., 81-0713
Kondo, K., 81-0143
Kondo, T., 81-0794, 81-0797
Kondrat'ev, Yu. A., 81-0055
Konno, N., 81-0792, 81-0798, 81-0799
Koransky, W., 81-0520
Korosfalvi, M., 81-0506
Korsak, R. J., 81-0693
Korte, F., 81-0255, 81-0390
Koschier, F. J., 81-0770
Kosinova, N. R., 81-0555
Koskinen, A., 81-0664
Koss, G., 81-0520, 81-0520
Koster, P. B., 81-0117
Kot, A., 81-0384
Kovalev, I. E., 81-0628
Koyama, K., 81-0233
Kramer, R. M., 81-0404
Kraus, P., 81-0520
Krause, R. T., 81-0286, 81-0581
Krieger, R. I., 81-0605
Krishna, M., 81-0535
Krishnakumari, M. K., 81-0518
Kristmanson, D. D., 81-0432
Kroop, S., 81-0622
Krynitsky, A. J., 81-0649
Krzymien, M., 81-0106, 81-0107
Kubota, S., 81-0300
Kuchar, E. J., 81-0840
Kudo, Y., 81-0800
Kuehl, D. W., 81-0580
Kuhlmann, F., 81-0573
Kulka, M., 81-0389
Kulkarni, A. P., 81-0772
Kulshrestha, A. K., 81-0204
Kupfer, D., 81-0224
Kurihara, H., 81-0794
Kurihara, N.5, 81-0754
Kurinnyi, A. I., 81-0199
Kurlowicz-Sidun, B., 81-0240
Kusano, E., 81-0795
Kutizova, N. M., 81-0217
Kutsenogii, K. P., 81-0121
Kuwabara, N., 81-0744
Kuz'menko, N. M., 81-0199
Kuznetsov, Yu. G., 81-0555
La Monica, E., 81-0229
LaBorde, J. B., 81-0547
Ladonin, V. F., 81-0002, 81-0301
Lagana, A., 81-0256
Laget, P., 81-0756
Lalich, J. J., 81-0804, 81-0805
Laltoo, M., 81-0152
Lamb, M. J., 81-0251
Lammert, S. L., 81-0886
Lamont, T. G., 81-0416
Lamoureux, C. H., 81-0283
Lamoureux, G. L., 81-0085, 81-0086
Lane, D. D., 81-0238
Lane, R. W., 81-0840
Langlais, B., 81-0459
LaPierre, R. B., 81-0574
Laranjeira, M. C. M., 81-0469
Larimer, F. W., 81-0607
Larson, P. S., 81-0840
Lassiter, R. R., 81-0063
Lassmann, A., 81-0536
Latalski, M., 81-0477
LaVine, P., 81-0318
Law, S. E., 81-0615
Lawrence, J. F., 81-0272, 81-0562
81-0584
Leahey, J. P., 81-0108
Leard, R. L., 81-0417
Leavitt, J. R. C., 81-0033, 81-0311
Lee, G. F., 81-0065
Lee, H. B., 81-0276
Lee, J. K., 81-0096
Lee, S. D., 81-0601
Lee, S. H. S., 81-0152
Legube, B., 81-0459
Lehrbach, P. R., 81-0456
Leidy, R. B., 81-0380
Leistra, M., 81-0110, 81-0111
LeLacheur, K. E., 81-0379
Leng, M. L., 81-0734
Leonard, E. N., 81-0580
Leonard, R. A., 81-0405
Leone, V. G., 81-0548
Lerman, B. B., 81-0463
Lesca, P., 81-0356
Leskijarvi, T., 81-0073
Letourneau, L., 81-0105
Levesque, D., 81-0882
Levey, R. H., 81-0169
Levi, P., 81-0852
Levinskas, G. J., 81-0067
Levison, S. A., 81-0846
Lewis, P., 81-0447
Lewitt, P. A., 81-0497
Lichtenstein, E. P., 81-0429
Liddle, J. A., 81-0260
Lilly, L. J., 81-0251
Linder, R. E., 81-0847
Lines, J. D., 81-0843
Lingens, F., 81-0200
Linko, R. R., 81-0101
Lipshultz, L. I., 81-0141
Liska, D., 81-0726
Litten, S., 81-0438
Little, L. W., 81-0737
Liu, D. H. W., 81-0157
Livingston, R. L., 81-0401
Loeffler, R. S. T., 81-0670
Loeser, F., 81-0719
Lokke, H., 81-0883
Longmuir, I. S., 81-0252
Longoni, A., 81-0043, 81-0351
Loomis, C. W., 81-0540
Lopez-Avila, V., 81-0889
Lord, K. A., 81-0236, 81-0646
Lores, E. M., 81-0691, 81-0895
Lorinczi, I., 81-0506
Lowry, S. R., 81-0867
Lozowski, S. Z., 81-0474
Lu, A. Y. H., 81-0764
Luciak, M., 81-0222
Luebke, R. W., 81-0613
Lukan'ova, A. M., 81-0194
Lukas, E., 81-0049
Luster, M. I., 81-0613
Lutz, D., 81-0166
MacDonald, M. G., 81-0225
Macek, K., 81-0062
Macek, K. J., 81-0156
Maclure, K. M., 81-0450
Macmahon, B., 81-0450
Magistrini, M., 81-0510
Mahanty, H. K., 81-0243
Mahelova, E., 81-0072, 81-0182
Mahmood, A., 81-0247
Maibach, H. I., 81-0531
Majors, R. E., 81-0591
Majumder, S. K., 81-0298, 81-0518
Makarian, A. S., 81-0135
Makarov, V. I., 81-0121

Makhamatova, Ya., 81-0851
Maki, A. W., 81-0003, 81-0005
81-0062, 81-0068, 81-0125, 81-0155
Makino, T., 81-0794
Malek, R. S., 81-0214
Malenkov, A. G., 81-0628
Malinin, O. A., 81-0598
Mallet, V. N., 81-0860, 81-0882
Maly, M. P., 81-0498
Mancall, E. L., 81-0196
Mandal, P. K., 81-0204
Manlove, R., 81-0236
Mann, J. B., 81-0453, 81-0593
81-0594
Mann, W., 81-0445
Marco, G. J., 81-0866
Marek, B., 81-0788
Mariani, L., 81-0548
Marin, A. B., 81-0278
Markiewicz, E., 81-0017
Marlowe, C., 81-0550
Marquiss, M., 81-0528
Marschall, T., 81-0788
Marsel, J., 81-0899
Marsh, J. A. P., 81-0648
Martin, G., 81-0095
Martin, G. C., 81-0318
Martin, J. P., 81-0093, 81-0094
Martin, P., 81-0252
Martin, R. A., 81-0025
Martson', L. V., 81-0199
Marucchini, C., 81-0269
Masoero, M., 81-0352
Massardo, P., 81-0043
Masuda, Y., 81-0016
Matano, O., 81-0874, 81-0892
Mathur, S. N., 81-0032
Matkovics, B., 81-0515
Matsui, I., 81-0143
Matsumori, H., 81-0744
Matsumoto, N., 81-0793
Matsumoto, T., 81-0744
Matsumoto, U., 81-0533
Matsumura, F., 81-0755
Matsuo, M., 81-0184
Matsuoka, S., 81-0016
Matthey, E., 81-0665
Matveev, Yu. M., 81-0060
Mayer, F. L., 81-0062
Mayes, B. A., 81-0502
Mayfield, C. I., 81-0434
McCarty, L. P., 81-0214
McDonald, P. T., 81-0314
McDonell, D., 81-0119
McDougall, K. W., 81-0587
McFarland, J., 81-0087
McGregor, W. R., 81-0370
McKenna, M. J., 81-0758
McKercher, R. B., 81-0370
McLane, M. A. R., 81-0748
McLeod, H. A., 81-0100, 81-0272
McManus, M. E., 81-0853
McVey, D. L., 81-0531
Meallier, P., 81-0388
Meedel, T. H., 81-0566
Mehendale, H. M., 81-0248
Mehra, M., 81-0752
Mehta, S. K., 81-0247
Melcher, R. G., 81-0871
Mellis, J. M., 81-0353
Meloni, C., 81-0081
Mendel, J., 81-0231
Mendez, F., 81-0378
Mendis, C. L., 81-0040
Menna, J. H., 81-0246
Menzel, D. B., 81-0740, 81-0742
Menzie, C. A., 81-0435
Messelson, M., 81-0722
Mestres, R., 81-0564
Metcalf, R.L., 81-0483
Metelitsa, G. I., 81-0554
Meyer, J. A., 81-0672
Meyer, M., 81-0438
Michalska, M., 81-0173
Michaud, M., 81-0616
Milby, T., 81-0141
Miller, D. S., 81-0765
Miller, G. C., 81-0084
Miller, M., 81-0036
Mills, H. A., 81-0615
Minchew, C. D., 81-0480
Miranenka, A. V., 81-0642
Mishra, R. K., 81-0757
Misra, B. N., 81-0509
Misra, S. S., 81-0676
Mitcham, R. P., 81-0782
Mitchell, A. D., 81-0776
Mitchell, C. J., 81-0320
Mitchell, S. C., 81-0492
Mito, K., 81-0145
Mitsueda, J., 81-0839
Miwa, G. T., 81-0764
Miwa, S., 81-0793
Miyakawa, M., 81-0838
Miyamoto, J., 81-0468
Miyamoto, T., 81-0099
Miyashita, M., 81-0663, 81-0784
Miyazaki, T., 81-0386
Mlynarczyk, W., 81-0242
Mochizuki, E., 81-0300
Moeller, F., 81-0461
Moeschlin, S., 81-0185
Mohanty, P., 81-0023
Mohn, G. R., 81-0751
Molina, C., 81-0837
Monaco, T. J., 81-0656
Monig, E. C., 81-0737
Montgomery, M. R., 81-0511
Moons, C., 81-0672
Moore, C. V., 81-0320
Moore, J. A., 81-0613
Moore, J. C., 81-0163
Moreale, A., 81-0403
Morello, A., 81-0195
Morgade, C., 81-0631
Morgan, D. P., 81-0464, 81-0836
Morizot, J. P., 81-0852
Morpurgo, G. P., 81-0229
Moseman, R. F., 81-0287, 81-0643
81-0691
Moses, E. B., 81-0246
Moshier, L. J., 81-0367
Moss, A., 81-0622
Moss, A. A. H., 81-0323
Moss, D., 81-0528
Mount, D. I., 81-0124
Mourer, C., 81-0087, 81-0284
Mower, M. M., 81-0491
Moye, H. A., 81-0858
Muccitelli, R. M., 81-0224
Mudd, J. B., 81-0601
Mueller, W., 81-0255
Mukerji, D., 81-0032
Mukku, V. R., 81-0220
Mulhern, B., 81-0766
Mulhern, B. M., 81-0418
Mulla, M. S., 81-0312
Mumma, R. O., 81-0868
Munson, A. E., 81-0845
Murray, H. E., 81-0387
Murty, A. S., 81-0090
Musamukhamedov, S. R., 81-0698
Mussgnug, G. L., 81-0026
Nabrzyski, M., 81-0310
Nachtomi, E., 81-0490
Nagabhushanam, R., 81-0206
Nagat, M., 81-0791
Nagayoshi, E., 81-0892
Nagendrappa, G., 81-0408
Nagymajtenyi, L., 81-0482
Nair, M. N. B., 81-0031
Nakajima, M., 81-0754
Nakamura, I., 81-0800
Nakamura, K., 81-0791
Nakayama, J., 81-0796
Nakos, G., 81-0120
Navarro, P., 81-0746
Neal, R. A., 81-0223, 81-0362
81-0760
Neale, M. C., 81-0236
Needham, L. L., 81-0260
Neff, G. S., 81-0387
Nehez, M., 81-0506
Nelson, L. A., 81-0681
Nemcova, M., 81-0049
Nesbitt, H. J., 81-0440, 81-0441
Neu, I., 81-0228
Neudecker, T., 81-0166
Newsome, W. H., 81-0098
Newton, I., 81-0528
Newton, J., 81-0339
Nimmo, D. R., 81-0163
Nishida, N., 81-0800
Nishijima, C., 81-0318
Nishimoto, S., 81-0145
Nishimura, T., 81-0801
Nishiyama, K., 81-0667
Nizamani, S. M., 81-0164
Nogawa, K., 81-0892
Nohynek, G., 81-0255
Nome, F., 81-0469
Nomura, S., 81-0891
Norheim, G., 81-0262
Norris, D. R., 81-0485
Norton, S., 81-0609
Nowlain, R. E., 81-0497
Nutbeam, A. R., 81-0354
Nuuja, I., 81-0395
O'Connor, D. J., 81-0439
O'Keefe, P., 81-0722
O'Keeffe, M., 81-0651

O'Shea, T. J., 81-0416
O'Sullivan, J., 81-0655
Oda, S., 81-0793
Oehlmann, L., 81-0091
Ogasawara, S., 81-0233
Ogierman, L., 81-0288
Ohara, S., 81-0560
Ohkawa, H., 81-0468
Oien, N., 81-0235
Okawada, N., 81-0797
Oki, M., 81-0669
Okland, E. M., 81-0262
Okonogi, K., 81-0838
Okura, I., 81-0768
Olah, I., 81-0711
Oledzka, R., 81-0568
Oliver, B. G., 81-0257
Olsen, P., 81-0647
Olson, J. R., 81-0362
Olson, R. D., 81-0454
Omiya, J., 81-0666
Ono, S., 81-0891, 81-0893
Onodera, S., 81-0878
Onsager, J. A., 81-0342
Onuska, F. I., 81-0561
Orr, D. E., 81-0158
Os'kina, V. N., 81-0267
Oshita, H., 81-0468
Osterroht, C., 81-0411
Oswald, E. O., 81-0643
Otagiri, M., 81-0533
Ott, M. G., 81-0454
Owen, R. E., 81-0181
Ozburn, G. W., 81-0158
Paasivirta, J., 81-0073, 81-0266
Padarathsingh, M. L., 81-0613
Padbury, C. E., 81-0424
Paksy, K. A., 81-0785
Palaniswamy, P., 81-0324
Paldy, A., 81-0506
Palisano, P., 81-0457
Pallister, P. D., 81-0462
Palokangas, R., 81-0395
Pandalai, R. C., 81-0031
Pank, F., 81-0116
Panopio, L. G., 81-0272, 81-0584
Papadopoulou-Mourkidou, E., 81-0274
Parkman, R., 81-0169
Parlar, H., 81-0390
Parris, G. E., 81-0428
Parrish, P. R., 81-0006, 81-0160
Parrish, R., 81-0065
Partridge, G. G., 81-0219
Parveen, F., 81-0733
Pashko, L. L., 81-0252
Pasteur, N., 81-0529
Patel, K. R., 81-0031
Patil, R. B., 81-0408
Patton, D. E., 81-0704
Patumi, M., 81-0269
Paulov, S., 81-0168
Paulovova, J., 81-0168
Paulson, G. D., 81-0542
Pavletits, O., 81-0711
Pazderova-Vejlupkova, J., 81-0049
Peet, N. P., 81-0214
Peng, S. Y., 81-0053
Penionzhek, S. A., 81-0355
Penner, D., 81-0033, 81-0311, 81-0365
Pepino, R. V., 81-0070
Perrin, J. H., 81-0533
Perry, A. S., 81-0750
Perucci, P., 81-0046
Pessoney, G. F., 81-0417
Pestemer, W., 81-0445
Peters, L. J., 81-0733
Peterson, J., 81-0068
Petrocelli, S. R., 81-0156
Petronio, B. M., 81-0256
Petrovskaia, O. G., 81-0199
Petukhova, V. I., 81-0102
Pfannhauser, W., 81-0572
Phillips, J. N., 81-0044
Phillips, M. P., 81-0671
Piccardi, P., 81-0043
Pickova, J., 81-0049
Picot, J. J. C., 81-0432
Pierce, R. H., 81-0485
Pierse, C., 81-0651
Pilenkova, I. I., 81-0876
Pilinskaia, M. A., 81-0199
Pilon, J. C., 81-0289
Pimental, D., 81-0622
Piper, W. N., 81-0165
Pipy, B., 81-0854
Pitas, R. E., 81-0221
Planet, G., 81-0250
Platzer, E. G., 81-0317
Plewinski, J., 81-0173
Plowright, R. C., 81-0020, 81-0181
Pluta, J., 81-0057, 81-0058
Pocchiari, F., 81-0327
Podolak, M., 81-0471, 81-0472
Pogorzelska, H., 81-0241
Pogson, C. I., 81-0767
Poiger, H., 81-0335
Poku, J. A., 81-0442
Poland, A., 81-0610
Poley, C., 81-0229
Pope, C. R., 81-0844
Popov, P. V., 81-0218
Popper, H., 81-0835
Portales, A., 81-0378
Pottinger, R. P., 81-0414
Prasad, O., 81-0213
Preussmann, P., 81-0128
Primak-Miroliubov, V. N., 81-0142
Pritchard, J. B., 81-0765
Pritchard, M. K., 81-0366
Pritchard, P. H., 81-0061
Prival, M. J., 81-0699
Prokopenko, V. A., 81-0433
Prokopy, R. J., 81-0341
Prouty, R. M., 81-0419
Pulatov, R. P., 81-0851
Pulman, D. A., 81-0806
Puntari, I., 81-0101
Purshottam, T., 81-0465
Pushpendran, C. K., 81-0519
Putinsev, A. I., 81-0167
Qadri, S. S. H., 81-0047
Quadrelli, L., 81-0352
Quast, J. F., 81-0758
Quesenberry, P. J., 81-0169
Quilt, P., 81-0398
Quinlan, R. A., 81-0767
Quirk, M., 81-0438
Racz, W. J., 81-0540
Raffi, G. B., 81-0134
Rai, K., 81-0761
Rajendra, W., 81-0188
Raju, G. S., 81-0298
Ramachandran, M., 81-0205
Ramade, F., 81-0180
Ramesh, H. P., 81-0518
Rand, G. M., 81-0162
Ranfft, K., 81-0596
Rao, B. B., 81-0047
Rao, C. D., 81-0890
Rao, D. M. R., 81-0090
Rao, P. J., 81-0030
Rao, P. R., 81-0114
Rappeport, J., 81-0169
Rashad, M. N., 81-0693
Rath, S., 81-0509
Rattayova, E., 81-0182
Reed, S. D., 81-0462
Rege, M. S., 81-0203
Reichert, E. L., 81-0693
Reichhart, D., 81-0048
Reider, R., 81-0491
Reifenrath, W. G., 81-0531
Reimer, G. J., 81-0410
Reitz, R. H., 81-0758
Renner, G., 81-0253, 81-0254
Repetto, Y., 81-0195
Resh, V. H., 81-0313
Retnakaran, A., 81-0340
Reuber, M. D., 81-0186
Reyes, A. A., 81-0655
Rice, J. R., 81-0857
Richard, J. J., 81-0420
Riedl, H., 81-0343
Rietbrock, N., 81-0536
Riker, W. F., 81-0532
Rios de Molina, M. D. C., 81-0524
Rizvi, S. J. H., 81-0032
Robacker, K. M., 81-0772
Roberts, R. J., 81-0464
Robinson, K. M., 81-0216
Robinson, P. B., 81-0531
Robison, A. K., 81-0220
Rodd, F. H., 81-0181
Rodgers, J. H., 81-0161
Roffi, J., 81-0180
Rogan, W. J., 81-0455
Rogers, L., 81-0633
Roggi, C., 81-0081, 81-0576
Rogozhnikov, V. G., 81-0103
Roland, J. V., 81-0070
Rolecki, R., 81-0179
Romeo, G., 81-0239
Roos, A., 81-0073
Rose, J. D. R., 81-0038
Roseboom, D. P., 81-0686
Roslavtseva, S. A., 81-0217
Ross, C. E., 81-0141
Ross, R. T., 81-0705
Rotatori, M., 81-0256
Rothman, A. M., 81-0270, 81-0583
Rotteveel-Smijs, G. M. T., 81-0751

Rouchaud, J., 81-0672
Roux, F., 81-0553
Roy(Shapira), A., 81-0841
Rozee, K. R., 81-0152
Rozhkova, N. G., 81-0055
Rozycka, B., 81-0118
Rubin, B., 81-0311
Ruegg, E. F., 81-0646
Ruhl, D., 81-0527
Rushneck, D. R., 81-0036
Rusness, D. G., 81-0085, 81-0086
Russ, O. G., 81-0367
Russell, L. C., 81-0481
Ruzo, L. O., 81-0096, 81-0234
Ryan, J. J., 81-0289
Ryan, M., 81-0169
Ryan, M. F., 81-0612
Rycaj, B., 81-0288
Ryskiewich, D. P., 81-0095, 81-0866
Sadar, M. H., 81-0781
Sadowski, C., 81-0242
Saettler, A. W., 81-0311
Saito, G., 81-0791
Sakharov, V. M., 81-0121
Salaun, J. P., 81-0048
Saleh, M. A., 81-0777
Sallam, M., 81-0706
Salleh, Y. B., 81-0501
Salomon, J., 81-0491
Samoilov, L. N., 81-0002, 81-0301
Sampson, D. A., 81-0221
San Martin de Viale, L. C., 81-0524
81-0525, 81-0526
Sanborn, J., 81-0065
Sandhu, S. S., 81-0778
Saner, W. A., 81-0595
Santelmann, P. W., 81-0012
Sanyal, S., 81-0517
Sapegin, D. I., 81-0692
Sarhan, M. E., 81-0320
Sarkka, J., 81-0073
Sasai, K., 81-0793
Sasaki, S., 81-0668
Sato, M., 81-0838, 81-0839
Sato, M. M., 81-0693
Sattar, M. A., 81-0266
Saunders, R. L., 81-0534
Savage, E. P., 81-0140
Savchenko, V. I., 81-0037
Scanlon, P. F., 81-0486, 81-0640
Scarponi, L., 81-0046
Schaefer, C. H., 81-0312
Schaffner, F., 81-0835
Schaich, K. M., 81-0495
Schapiro, M., 81-0042
Schefer, W., 81-0571
Scheidl, I., 81-0572
Scheier, A., 81-0068
Scheviak, L. A., 81-0681
Schlatter, C., 81-0335
Schnur, M., 81-0150
Scholten, A. H. M. T., 81-0562
Schreiner, I., 81-0622
Schulten, H. R., 81-0897
Schumann, A. M., 81-0758
Schumann, G., 81-0599
Schwarz, H., 81-0231
Secrest, W. L., 81-0658, 81-0866
Sedykh, A. S., 81-0218
Seiber, J. N., 81-0862
Sekigawa, N., 81-0874
Selikoff, I. J., 81-0835
Seltmann, H., 81-0305
Selypes, A., 81-0482, 81-0506
Senczuk, M., 81-0242
Senczuk, W., 81-0241
Senesi, N., 81-0680
Senetskaya, L. P., 81-0900
Senger, H., 81-0527
Sergeeva, D., 81-0104
Seto, Y., 81-0791
Settle, H., 81-0647
Seubert, A., 81-0520
Seubert, S., 81-0520
Severinov, I. S., 81-0692
Seyfried, P. L., 81-0159
Shabanov, A. K., 81-0373
Shadoff, L. A., 81-0602
Shafik, T. M., 81-0887
Shah, J. J., 81-0031
Shamirzaev, N. Kh., 81-0698
Shapovalov, A. A., 81-0055
Shapovalova, G. K., 81-0218
Sharma, A., 81-0834
Sharma, R. A., 81-0050
Sharma, R. P., 81-0769
Sharma, S. K., 81-0029
Sharma, V. K., 81-0558
Sharma, Y. P., 81-0050
Sheets, T. J., 81-0379, 81-0380
81-0656, 81-0681
Sheffy, T. B., 81-0007
Shellenberger, T. E., 81-0774
Shelley, M. W., 81-0782
Shepard, M., 81-0622
Shepel'skaia, N. R., 81-0199
Shestakov, V. G., 81-0060, 81-0373
Shethna, Y. I., 81-0890
Sheu, C. W., 81-0535
Shiaku, K., 81-0144, 81-0232
Shiga, N., 81-0874, 81-0892
Shimabukuro, R. H., 81-0034
Shimizu, G., 81-0300
Shimizu, S., 81-0839
Shiomyra, T., 81-0793
Shipobski, A. K., 81-0642
Shirko, T. S., 81-0103
Shivanandappa, T., 81-0518
Shoup, T. D., 81-0097
Shpirt, M. B., 81-0136
Shtenberg, A. I., 81-0197, 81-0198
Shu, S. S., 81-0358
Shukanov, U. P., 81-0642
Shustova, V. I., 81-0217
Sibbett, G. S., 81-0318
Sieniawska, T., 81-0177
Sienkiewicz, E., 81-0473
Sienkiewitcz, E., 81-0171
Sigmon, C. F., 81-0848
Silano, V., 81-0328, 81-0329, 81-0330
81-0331, 81-0332, 81-0333
Silowiecki, A., 81-0288
Simkins, G. S., 81-0367
Simmon, V. F., 81-0776
Simoneaux, B. J., 81-0095, 81-0658
Singer, A. W., 81-0844
Singh, H., 81-0507
Singh, K., 81-0082
Singh, T. P., 81-0507
Singh, U. S., 81-0885
Sinha, A. P., 81-0082
Siverina, A. A., 81-0295
Skalsky, H. L., 81-0659, 81-0771
Skipper, H. D., 81-0406
Slimak, K., 81-0363
Smagula, J. M., 81-0616
Smetacek, V., 81-0411
Smith, A. D., 81-0158
Smith, A. E., 81-0422
Smith, D. C., 81-0100
Smith, L. L., 81-0511
Smith, L. L., Jr., 81-0004
Smith, R., 81-0141
Smrek, A. L., 81-0260
Snelson, J. T., 81-0671
Soares, G., 81-0316
Sokolov, M. S., 81-0142
Solch, J. G., 81-0569
Soliman, A. S., 81-0189, 81-0190
Sollers-Riedel, H., 81-0041
Sonanwane, B. R., 81-0541
Spain, J. C., 81-0061
Spalding, R. F., 81-0420
Spangler, N., 81-0273
Spanier, R., 81-0653
Spates, G. E., 81-0345
Spear, R. C., 81-0097
Speck, M., 81-0884
Spencer, W. F., 81-0097
Spesivtsev, L. G., 81-0301
Spiegelhalder, B., 81-0128
Spiker, R., 81-0303
Spiridonov, Yu. Ya., 81-0060, 81-0373
Spirina, T. A., 81-0217
Sprague, J. B., 81-0004
Springell, P. H., 81-0052
Spynu, E. I., 81-0077
Sridhara, S., 81-0539
Srihari, K., 81-0539
Srivastava, V. K., 81-0213
St. John, P. A., 81-0858
Stafford, C., 81-0418
Stahr, H. M., 81-0279
Stan, H. J., 81-0297
Stancel, G. M., 81-0220
Stanley, J. G., 81-0650
Stara, J. F., 81-0741
Staten, R. T., 81-0342
Stern, A. M., 81-0066
Sternersen, J., 81-0235
Stewart, J. K., 81-0617, 81-0617
Stewart, K., 81-0846
Stewart, T. E., 81-0870
Sticka, R., 81-0671
Stillwell, R. N., 81-0869
Stimac, J. L., 81-0013
Stinson, R. S., 81-0842
Stinson, S. F., 81-0215
Stobbe, E. H., 81-0369
Stockdaly, E. M., 81-0464
Stoeber, I., 81-0897

Stokols, M. F., 81-0770
Stone, W. B., 81-0413
Stonefield, K. I., 81-0431
Stork, J. R., 81-0886
Stralka, K., 81-0406
Streit, B., 81-0557
Strik, J. J. T. W. A., 81-0337 81-0338, 81-0523
Strohmayer, A., 81-0786
Strzelec, A., 81-0644
Stsiapanava, E. I., 81-0641
Subrahmanyam, B., 81-0030
Subrahmanyam, D., 81-0517
Suda, K., 81-0838
Sudo, A., 81-0838
Suett, D. L., 81-0424
Sugaya, H., 81-0668
Sugaya, Y., 81-0663, 81-0784
Sugioka, K., 81-0891
Sullivan, L. J., 81-0208, 81-0211
Sullivan, R., 81-0169
Sullivan, R. I., 81-0028
Summers, M. D., 81-0687
Sumner, D. D., 81-0658
Sundaram, K. M. S., 81-0879
Surovtseva, E. G., 81-0076
Susan, M., 81-0715
Sutherland, S., 81-0697
Suzuki, M., 81-0437
Suzuki, S., 81-0878
Suzuki, Y., 81-0794
Swami, K. S., 81-0188
Sweeney, G. D., 81-0226
Swift, R., 81-0647
Swineford, D., 81-0508
Sylwestrazak, J., 81-0385
Szabo, L., 81-0515
Szajkowski, Z., 81-0383
Szczepaniak, S., 81-0171, 81-0176 81-0473, 81-0476
Szenzenstein, M., 81-0710
Szeto, S. Y., 81-0879
Szollosi, S., 81-0510
Szwejda, J., 81-0385
Szymczak, J., 81-0018, 81-0019 81-0309
Szymezyk, T., 81-0172
Tabata, M., 81-0878
Tafuri, F., 81-0046, 81-0269
Tagatz, M. E., 81-0154
Tagesson, C., 81-0347
Taira, M. C., 81-0525
Taitelman, U., 81-0841
Takamatsu, M., 81-0669
Takashina, N., 81-0145
Takekawa, T., 81-0793
Tallant, M. J., 81-0208, 81-0211
Talova, V. I., 81-0301
Talukder, G., 81-0834
Tanaka, Y., 81-0795
Taniguchi, E., 81-0372
Tardiff, R. G., 81-0604
Tashiro, N., 81-0143
Taylor, J. H., 81-0036
Taylor, M. L., 81-0569
Tayyaba, K., 81-0496
Teichert-Kuliszewska, K., 81-0172
Teitei, T., 81-0045
Tennankore, K., 81-0432
Terce, M., 81-0375, 81-0376
Terman, C. R., 81-0394
Terukimatusu, S., 81-0795
Tessari, J. D., 81-0140
Testini, C., 81-0680
Tewari, S. N., 81-0865
Thaler, G. R., 81-0020
Thielemann, H., 81-0559
Thomas, Q. V., 81-0886
Thomas, V. M., 81-0407
Thomason, I. J., 81-0011
Thompson, N. P., 81-0581
Thompson, T., 81-0622
Thuan, N. K., 81-0768
Thurston, H. D., 81-0010
Thust, R., 81-0231
Tiernan, T. O., 81-0569
Tikanmaki, E., 81-0101
Tilson, M. D., 81-0545
Tipton, A. R., 81-0486
Tiuriukanova, G. K., 81-0142
Tiwari, L. D., 81-0030
Tluczkiewicz, J., 81-0478
Tobin-Gros, C., 81-0575
Todd, B. G., 81-0369
Tofilon, P. J., 81-0165
Tokieda, M., 81-0891
Tolkacheva, T. I., 81-0851
Tomizawa, C., 81-0801
Tomkins, D. F., 81-0292
Tomova, L., 81-0132, 81-0133
Tong-Ngork, T., 81-0438
Toone, C. K., 81-0802
Torii, M., 81-0144, 81-0232
Townsend, D. I., 81-0346
Townsend, J. C., 81-0454
Toyama, N., 81-0891, 81-0893
Traag, W. A., 81-0277
Traiger, G. J., 81-0245
Treich, I., 81-0553
Trial, J. G., 81-0650
Tripathi, R. K., 81-0885
Triplett, G. B., Jr., 81-0404
Trottier, B., 81-0250
Trujillo, D. A., 81-0873
Trumble, J. T., 81-0325
Tsao, P. W., 81-0316
Tso, T. C., 81-0379
Tsubota, M., 81-0145
Tsuge, S., 81-0801
Tsuji, S., 81-0575
Tsukada, S., 81-0891
Tuinstra, L. G. M. T., 81-0277
Tummala, R. L., 81-0014
Turner, K., 81-0001, 81-3601
Tyburczyk, W., 81-0177, 81-0178 81-0475
Ueda, K., 81-0233
Ugarova, N. N., 81-0600
Uhnak, J., 81-0072
Undeen, A. H., 81-0227
Unoki, T., 81-0793
Ure, A. M., 81-0563
Usuya, S., 81-0667
Utracki, T., 81-0071
Valencia, R., 81-0776
Valens, M., 81-0180
Vamos, G., 81-0713
Van Bladel, R., 81-0403
van Bladeren, P. J., 81-0751
Van de Lagemaat, D., 81-0290
van der Gen, A., 81-0751
Van der Poll, J. M., 81-0290
van der Schalie, W. H., 81-0008
Van Miller, J. P., 81-0804, 81-0805
Van Ryzin, J., 81-0761
Van Stee, E. W., 81-0759
van Tiel, N., 81-0148
Vandekar, M., 81-0728
Vanhee, J., 81-0494
VanNess, G. F., 81-0569
Varela, G., 81-0746
Varga, S. I., 81-0515
Varnagy, L., 81-0718
Vasil'eva, G. K., 81-0076
Vasilenko, V. E., 81-0577
Vatsa, V. K., 81-0050
Veith, G. D., 81-0156, 81-0580
Veres, D. F., 81-0582
Verkhovskii, A. P., 81-0556
Verma, S., 81-0113
Verma, S. R., 81-0504
Vijayalakshimi, S., 81-0512
Vink, G. J., 81-0505
Vinzant, B., 81-0622
Visweswariah, K., 81-0298
Viviano, G., 81-0328, 81-0329 81-0330, 81-0331, 81-0332, 81-0333
Vol'nova, A. I., 81-0076
von Windeguth, D. L., 81-0275
Voytenko, G. O., 81-0194
Waddell, W. J., 81-0550
Wagner, K., 81-0091
Wagner, N., 81-0149
Wainstock de Calmanovici, R., 81-0524 81-0526
Walker, B., Jr., 81-0137
Walker, C. H., 81-0808
Walker, C. R., 81-0066
Walker, G., 81-0087
Walker, W. A., 81-0416
Wallnoefer, P. R., 81-0091
Walsh, W. C., 81-0034
Walter, A. W., 81-0464
Wands, R. C., 81-0068
Warchocki, B., 81-0471
Ward, G. S., 81-0160
Ward, J. M., 81-0215
Ware, G. W., 81-0446, 81-0543 81-0630
Wargo, J. P., 81-0658
Warren, G. F., 81-0366
Warzok, R., 81-0231
Washino, R. K., 81-0313
Wasilewska, H., 81-0568
Watabe, K., 81-0668
Watanabe, P. G., 81-0758
Waters, M. D., 81-0776, 81-0778
Watson, J. R., 81-0440, 81-0441
Watts, R. R., 81-0287
Wauchope, R. D., 81-0405, 81-0592
Wax, L. M., 81-0364

Webster, G. R. B., 81-0410
Wedemeyer, G. A., 81-0534
Wedzisz, A., 81-0385, 81-0567
Weir, D., 81-0042
Weiss, A. H., 81-0574
Welch, K. J., 81-0580
West, S. D., 81-0585
Wheeler, W. B., 81-0581
White, D. H., 81-0419
Whitehead, E., 81-0284
Whiteside, T., 81-0623
Whitney, R. W., 81-0259
Whorton, D., 81-0141
Wickremesinghe, R. S. B., 81-0040
Wicks, G. A., 81-0443
Wicks, J., 81-0022
Wierzbicki, R., 81-0173
Wigelsworth, F. W., 81-0462
Wild, B. L., 81-0193
Wilkinson, C. F., 81-0611
Williams, W. P., 81-0354
Winchester, R. V., 81-0415
Winterlin, W., 81-0087, 81-0284
Winton, W., 81-0607
Witacre, D. M., 81-0088
Witschi, H. R., 81-0603
Witzemann, V., 81-0790
Wodicka, V. O., 81-0700
Woidlich, H., 81-0572
Wolfe, N. L., 81-0391
Wolff, F., 81-0719
Wolff, T., 81-0764
Wong, L., 81-0693
Wood, R. A., 81-0163
Woodrow, J. E., 81-0862
Worobey, B. L., 81-0392
Wrenn, J. M., 81-0771
Wright, J. E., 81-0345
Wright, S. J. L., 81-0398
Wyatt, I., 81-0511
Wybieralska, A., 81-0017
Yagasaki, K., 81-0797
Yamagishi, T., 81-0386
Yamaguchi, E., 81-0143
Yamaguchi, T., 81-0666
Yamamoto, I., 81-0099
Yamamoto, M., 81-0592, 81-0789
Yamato, Y., 81-0437
Yamauchi, T., 81-0792, 81-0798
81-0799
Yanagihara, K., 81-0099
Yarbrough, J. D., 81-0216
Yasuno, M., 81-0663, 81-0784
Yates, W. E., 81-0054
Yim, G. K. W., 81-0150
Yockim, R. S., 81-0689
Yopp, J., 81-0633
Yoshida, K., 81-0146, 81-0560
81-0795
Yoshizuka, K., 81-0669
Young, C. W., 81-0497
Younis, H. M., 81-0023
Yu, C. C., 81-0088
Yurkova, R. G., 81-0876
Zabik, M. J., 81-0096
Zagni, A., 81-0352
Zakirova, A. S., 81-0851
Zalom, F. G., 81-0314
Zapponi, G., 81-0328, 81-0329
81-0330, 81-0331, 81-0332, 81-0333
Zecca, E., 81-0081, 81-0576
Zemchenkova, G. K., 81-0876
Zepp, R., 81-0084
Zhavoronkov, N. I., 81-0556
Zhukova, P. S., 81-0103
Ziegler, W., 81-0091
Zilkey, B. F., 81-0431
Zimdahl, R. L., 81-0442
Zimmerli, B., 81-0788
Zinkel, D. F., 81-0632
Zisook, R., 81-0084
Zolotova, T. B., 81-0217
Zsifkov, T., 81-0720
Zuckerman, K. S., 81-0169
Zupancic, L., 81-0899
Zweidinger, R. A., 81-0737
Zweig, G., 81-0730
Zycinski, D., 81-0299

CORPORATE AUTHOR INDEX

Am. Inst. Biol. Sci., Arlington, VA, 81-0127
ASTM, Philadelphia, PA, 81-0126
Int. Joint Comm. US & Canada, Windsor, Ontario, Canada, 81-0637
Japanese Soc. Ind. Health, Tokyo, Japan, 81-0735
JRB Assoc. Inc., McLean, VA, 81-0738
NCI, Bethesda, MD, 81-0849
NIOSH, Cincinnati, OH, 81-0736
US EPA, Washington, DC, 81-0739

☆ U. S. GOVERNMENT PRINTING OFFICE: 1981—341-831/10

The Administrator of the U.S. Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical approved by the Director of the Office of Management and Budget February 6, 1973.

Pesticides Abstracts is available on 16 mm microfilm. Additional information can be obtained from the Technical Services Division.

ORDER FORM FOR
PESTICIDES ABSTRACTS

To: Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

Please enter my subscription for Pesticides Abstracts. I am enclosing Money Order ☐ Check ☐ for this subscription.
($21.00 a year; $5.25 additional for foreign mailing.)

Please address as follows: _____

_____

_____

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 1968

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Subscription price, domestic, $21.00 a year, $5.25 additional for foreign mailing. Price for a single copy of this issue is $1.60, Index issue $2.35.

United States
Environmental Protection
Agency

Official Business
Penalty for Private Use
$300

TS-793: Rm: E-447

Washington DC 20460

Fourth-Class Mail
Postage and Fees Paid
EPA
Permit No. G-35

1EPAPP810816 001364535006 001
SERIALS DEPT
XEROX UNIVERSITY MICROFILMS
300 NORTH ZEEB ROAD
ANN ARBOR MI 48106